

CHEMICAL ABSTRACTS

Vol. 15.

FEBRUARY 10, 1921

No. 3.

I—APPARATUS

C. G. DERICK

Siphons for transferring and emptying acids, caustic solutions, etc. OSKAR KAUSCH. *Chem. App.* 7, 105-8, 153-5, 169-71(1920).—A review of Ger. patents, with 18 cuts.

J. H. MOORE

A special form of phosphoroscope (ANDREWS) 3.

Hydrometer. A. H. GILL. U. S. 1,359,455, Nov. 16. The hydrometer is provided with a plurality of scales one of which is graduated to indicate directly the amt. of a standard soln. or diluent to be added to bring the soln. under test to a predetermined standard strength. The instrument is especially intended for adjusting the strength of alc. solns. such as used as a "non-freezing" mixt. in automobile radiators.

Apparatus for distilling water or other liquids. W. A. RUSHWORTH. U. S. 1,359,276, Nov. 16.

Apparatus for heating and distilling water. R. S. MEARS. U. S. 1,358,091, Nov. 9.

Lead-burning apparatus. P. E. NORRIS. U. S. 1,358,869, Nov. 16.

Apparatus for carrying out chemical reactions. M. BRUTZKUS. Brit. 149,915, Aug. 4, 1920. An app. for carrying out chem. reactions consists of a compressor adapted to take in predetd. quantities of the reacting materials, to compress these to the desired pressure and temp. or alternatively to reduce their pressure and cool the gases, then to bring to reaction the compressed or rarefied materials, and after the completion of the reaction to discharge the products and to take in a new charge of materials; during the reaction stage, the materials may be in contact with catalysts, or may be subjected to elec. arc or spark discharges or to cathode rays or other radiations. A suitable construction is specified.

Apparatus for making a soluble extract of coffee or similar materials. H. ANHALTZER. U. S. 1,358,048, Nov. 9. The app. operates in a manner generally similar to that of a Soxhlet extn. app.

2—GENERAL AND PHYSICAL CHEMISTRY

WILLIAM E. HENDERSON

Electromagnetic theory is fundamental in the sciences. A. E. KENNELLY. *Elec. World* 77, 29-30(1921).—Review of the past year's developments. C. G. F.

More nearly rational system of units. ELLIOT QUINCY ADAMS. Bureau of Chemistry. *Science* 52, 525-9(1920).—It is possible to derive from the velocity of light ($c = 29,986 \times 10^6$) a system of physical units which is superior to the English and metric systems. The bases of this system are (1) the mean solar second, (2) a length of 29,986 cm. ($= c/10^6$), and (3) a mass of 25.636 g. ($= c/4\pi E^2$, where E is the electrochemical equivalent in c. g. s. units). By choosing this unit of mass and using the Heaviside definition of unit elec. charge it is possible to bring in harmony the e. m. units and e. s. units of elec. quantity and thereby derive a single unit of elec. quantity to serve for scientific and engineering purposes. In the proposed system the relations

among physical units become simpler and the calcs. of elec. and magnetic phenomena are reduced to plain arithmetic. However, the system requires the elimination of water as a standard of density. Conversion tables for geometric, kinematic, mechanical, elec., magnetic, and thermal units are given; likewise the numerical value of the five conversion factors.

INGO W. D. HACKE

The system benzene-ethyl alcohol-water, between +25 bbls. and -3 bbls. NGIL VINCENT SIDGWICK AND WILLIAM JAMES SPURRELL. *Oxford Univ. J. Chem. Soc.* 117, 1397-1404 (1920).—This question is of general theoretical interest, and also of some practical importance, in view of the use of mixts. of benzene and alc. as motor fuel. The method adopted was to prep. mixts. of alc. and water of known concn.; these were mixed with various known proportions of benzene, and the temp. was detd. at which the liquids sepd., or the benzene crystd. out. The temp. of the lowest point at which two liquid phases made up of water, alc. and benzene can coexist is shown to be 2.5°. The compn. of the liquid at this temp. is 80% benzene, 18% alcohol, and 2% water. If a fourth component (another aromatic hydrocarbon) were added, the f. p. of the benzene would be proportionately lowered (some 5° for 10%), but if a paraffin were used for this purpose, it would certainly increase the tendency of the liquid to sep. into two layers. The solv. of the paraffins in alc. containing water is extraordinarily small. For example, while 90% aq. alc. will dissolve up to four times its wt. of benzene, it will dissolve only 1/3 its wt. of hexane.

J. T. R. ANDREWS

Examination of Searle's method for determining the viscosity of very viscous liquids. KURT MOLIN. *Proc. Cambridge Phil. Soc.* 20, I, 23-34 (1920).—Searle's formula for coaxial oscillating cylinders takes the form $\eta = CMT/(l + k)$ where M is the mass of the two loads which are used to rotate the inner cylinder, T is the time required for one revolution, l is the length of the cylinder immersed in the liquid, k is an end correction, and C is a constant. For a given value of l , the product MT should be constant, but it is found that when M is below a certain value, MT tends to infinity. When $l = 10$ cm. this value is 100 g. Furthermore, the value of the correction k varies somewhat with the load M . These effects cannot be explained by pivot friction. The viscosity of treacle was 274.7 poises at 19.8° by Searle's method which agreed with that obtained by Poiseuille's method (271.1) to 1.3 percent. E. C. B.

Polychromatism of colloidal sulfur. R. AUERBACH. *Kolloid-Z.* 27, 223-5 (1920).—On adding H_3PO_4 to a soln. of $Na_2S_2O_3$, the colloidal S formed runs through a whole gamut of colors, which were measured by the color norms of Wilh. Ostwald. In one expt. over periods expressed in minutes the colors were: 1.5-3 min., bright yellow; 4-4 1/4 min., cress green; 6-8 min., red to violet; 9-24 min., hue becoming darker; 28-120 min., gray becoming brighter. The results are plotted against Gibbs triangular coordinates, the corners representing white, black and color, respectively. At the cress green the curve turns towards the black, indicating commencement of flocculation, the color becoming more and more turbid. Passing into the gray, the sol. begins to settle, and the S finally precipitates white. Spectroscopic examination confirms the theoretical views of W. Ostwald (*C. A.* 6, 1390). The experiment shows that color changes are possible with dielectrics as well as with metal sols, and exhibits the relation between color and degree of dispersion.

JEROME ALEXANDER

The conduct of electrolytic ions in solid bodies. II. Dissociation relations in permutite. A. GÜNTHER-SCHULZ. *Z. Elektrochem.* 26, 472-80 (1920); cf. *C. A.* 14, 678.—The electrolytic cond. and the change in mol. vol. of K-Cd, K-Pb, Li-Cd and K-Cr permutite mixts. have been measured. From the good agreement of the results of the measurements with those obtained from formulas derived on theoretical grounds, the following conclusions are drawn: (1) The dissociation ratios of K-permutite and Li-permutite are approx. the same as for the same salts in aq. soln., and change in the same manner with diln. (2) The law governing the mutual influence of the disso-

ciation of 2 salts with the same anion holds for solid permutites just as in aq. soln. (3) By the gradual addition to a strongly dissociated permutite of a weakly dissociated permutite, the mobility of the cation of the former is restrained, owing to the reduction of space at the disposal of the free cation by the undissociated cation of the 2nd permutite. (4) The permutite adjusts itself to the space requirements of each kind of action present in it. This adjustment takes place in such way that each pure permutite acquires a new mol. vol. which depends on the ionic vol. of its base. The addition of a base brings about a change in the mol. vol. which is proportional to the amt. added, so long as the quantity of H_2O of crystn. remains const. (5) While the other permutites investigated have 5 mols. of H_2O of crystn., Cr permutite combines with 13 mols. which are present in the interior of the mol. In consequence, the mobility of the Cr cation is very markedly increased, and in the case of pure Cr permutite it is of the same magnitude as in aq. soln. (6) If on the addition of a base a permutite mixt. of very small elec. cond. is formed, it takes 10 or more days until the base is uniformly distributed through the interior of the permutite.

H. JERMAIN CREIGHTON

The electrolytic formation of the alkali salts of ferrous oxide and of ferric oxide. G. GÄRTNER AND H. GMELIN. Techn. Hochschule, Stuttgart. *Z. Elektrochem.*, 26, 459-71 (1920).—By anodically polarizing Fe (previously activated by cathodic treatment), with a low c. d. in 40% NaOH soln. in the absence of air, it goes into soln. forming a Na salt of the acid H_2FeO_4 . At 80° and a c. d. of 0.166 amp./dm², a 0.026 molar soln. of this compd. has been prep'd. The anodic dissolution of Fe in concd. NaOH takes place in 2 stages at higher temps. and in the 1st stage, at 70° and between the potentials $e_h = -0.85$ and -0.83 v., the formation of bivalent Fe, and in the 2nd stage the formation of ferrate ions with simultaneous evolution of O. An intermediate step corresponding to the formation of a trivalent Fe ion has at no time been observed. It has been found possible to form $Na_2Fe_2O_4$ either by anodic oxidation of an alkaline ferrous soln., or by cathodic reduction of $Na_2Fe_2O_4$ soln. between Pt electrodes. *Calcn.* of the Fe^{++} concn. in a Na_2FeO_4 soln. and of the Fe^{+++} concn. in $Na_2Fe_2O_4$ soln., from the results of measurements of the equil. potentials of Pt against Na_2FeO_4 soln. and of Pt against $Na_2Fe_2O_4$, $Na_2Fe_2O_4$ soln., show the ferrite soln. to be very much more complex than the alkali ferrosoln. The anodic dissolution of bivalent Fe in 40% NaOH at 80° takes place at potentials $e_h = -0.84$ to -0.82 v. At potentials between $e_h = -0.8$ to -0.7 v., oxidation between Pt electrodes takes place as follows: $2FeO_4^{2-} + 2\oplus \rightleftharpoons Fe_2O_4^{2-}$. In 40% NaOH the equil. potential of the process $Fe + 2\oplus \rightleftharpoons Fe^{++}$ is $e_h = -0.86$ v., that of the process $Fe^{++} + \oplus \rightleftharpoons Fe^{+++}$ is $e_h = -0.69$ v., and that of the process $Fe^{+++} + 3\oplus \rightleftharpoons Fe^{++++}$ is $e_h = +0.55$ v. From potential measurements it has been found for $Fe + 3\oplus \rightleftharpoons Fe^{+++}$ that $e_h = -0.80$ v., and for $Fe + 6\oplus \rightleftharpoons Fe^{++++}$, $e_h = -0.13$ v.

H. JERMAIN CREIGHTON

The heat of reaction in the formation of calcium cyanamide. PAUL DOLCH. *Z. Elektrochem.*, 26, 455-9 (1920).—On the assumption of a complete (univariant) equil., the heat of reaction in the formation of $CaCN_2$ from CaC_2 and N has been calcd. with the help of the Nernst formula. The value 58,700 cal. (at ordinary temp. and const. pressure) per mol. of carbide has been obtained. By the application of the Nernst heat theorem the equil. temp.-pressure curve of the process has been traced.

H. JERMAIN CREIGHTON

Specific heat and thermal expansion of isometric crystals. K. FORSTERLING. *Z. Physik*, 3, 9-18 (1920).—P. treats mathematically the approx. calcn. of the part of the energy of a isometric crystal that depends on the elastic vibrations, which is important in the Debye and Einstein theories of specific heats.

F. C. HOYT

Researches at high pressure and temperature. C. A. PARSONS. *Proc. Roy. Inst. Great Britain*, preprint (Jan. 23, 1920).—A number of researches having to do with probable conditions obtaining in the earth at depths up to 12 miles are reviewed.

The app. required for researches at high temp. and pressure is described. Hardened steel dies with hydraulically operated plungers may be used. They may be made gas-tight by mild steel caps on the ends of the plungers and may be heated electrically or by gas. The dies will not stand much above 500-600°. In none of the expts. was graphite changed in any way nor were any traces of diamond found. At 15,000 atm. very intense beating was applied for 5 seconds only but sufficient in amt. to melt the graphite core 6 times over, the only result being a slight alteration of the structure of the graphite. The heat of combustion of graphite was found to be slightly less than that of diamond (1%) indicating that graphite under these conditions is still the stable state. Shooting a "0.303" steel rifle bullet with copper driving bands into a hole drilled in a steel block and filled with a mix. of O₂ and C₂H₂ was calcd. to give a temp. from 15,200° to 17,700° and a pressure of 15,000 atm., but graphite contained in the hole was unaltered and no trace of diamond could be found. No appreciable change in the conductance of graphite at these high temps. and pressures could be discovered such as is claimed to take place immediately before it melts.

E. H. DARBY

The rate of autodiffusion of melted lead. J. GROH AND G. V. HEVESY. *Ann. Physik* 63, 85-92 (1920).—An active Pb obtained from Th residue was melted and poured into a hard-glass tube about 3 mm. in diam. until it was filled to the depth of 1.5 cm. After it had cooled, about three times as much inactive Pb was added and the entire tube heated for from 0.5 to 2 days in an elec. oven to 342°. After cooling it was cut into four sections, each 1.5 cm. long, rolled into foil and the α -ray activity tested with the electroscope for each section. From this, the rate of diffusion of active and inactive Pb was obtained and is given in tabular form. The rate of autodiffusion is given as 2.2 cm.²/day. Reduced to the viscosity of water and room temp. this gives 2.1 cm.²/day. This is about three times the diffusion rate of Pb ion in water and indicates that the radius of the Pb ion must be at least three times as great as that of the atom (molecule) of molten Pb. This shows a high degree of hydration of the Pb ion in agreement with theoretical considerations.

E. H. DARBY

Present state of the knowledge of catalysis. A. MAILHE. *Rev. gen. sci.* 31, 681-92 (1920).—A review without references.

R. J. C.

Catalytic effects in the combustion of organic substances. I. H. V. EULER AND K. O. JOSEPHSON. Stockholm. *Brennstoff Chemie* 1, 63-6 (1920).—If one end of a 5 mm. strip of pure filter paper, supported horizontally in a space free of drafts, is ignited and the flame then extinguished, the smoldering dies out almost immediately. In case the line of smoldering travels along the strip, its rate of travel depends on the balance between (1) the heat required to decompose the cellulose, and (2) the heat furnished by combustion of the decompr. products, especially the solid ones. The presence of small quantities of inorg. salts influences this rate, or the duration of the smoldering, markedly; usually there is an optimum concn., at which uniform propagation takes place, but above and below which the smoldering dies out. Paper containing Na₂SO₄, CaCl₂, BaCl₂, Na₂HPO₄ and BaCO₃ in quantities ranging from 0.3×10^{-4} to 2.68×10^{-4} equiv. per sq. cm. gave definite times of smoldering ranging from 2 to 5.7 sec., while paper containing KCl, KNO₃, K₂CO₃, K₂SO₄, NaCl, LiCl, Li₂CO₃, NaBr and Na₂CO₃ in approx. the same quantities smoldered at constant rates varying from 5.8×10^{-1} to 19.6×10^{-2} cm. per sec. Comparison indicated that K and Li were the most effective ions, while Cl exerted a retarding effect. The influence of traces of ash in lowering the burning temp. of cane sugar suggested investigation of the catalytic effect of various salts on its thermal decompr. Mixts. of the substance in question with powdered sugar were heated slowly in recesses in a brass block containing a thermometer, the temp. of decompr. being indicated by gas evolution and discoloration (burning will proceed at any temp. which produces this decompr.). The substances tried were

CaCl_2 , NaOH , Na_2CO_3 , BaO , NaCl , BaCl_2 , CaO , Na_2SO_4 , CaCO_3 , BaSO_4 and CaSO_4 , which were effective in the order named; CaCl_2 lowered the decompr. temp. extraordinarily—0.4% of the dry salt (especially purified to eliminate traces of possible catalytic impurities) lowered this temp. from 212° to 182° . The gases given off contained 8–12% unsatd. hydrocarbons, 33–35% CO , 28–46% H_2 , less than 1% O_2 and CO_2 , and apparently traces of AcOH , $\text{H}_2\text{C}_2\text{O}_4$, AcCH_3 , HCHO and fursfural. W. B. V.

The alkylamines as solvents. HOWARD MCKEE ELSEY. *J. Am. Chem. Soc.* 42, 2080–5(1920).—The solubilities of some 85 elements and inorg. salts in anhydrous MeNH_2 , EtNH_2 , PrNH_2 , Me_2CHNH_2 , Me_2NH and Me_3N have been roughly detd. and the substances classified as very, moderately, slightly sol. and insol. The results show that the simpler primary and sec. amines at room temp. are fair solvents for many salts; the solubilities, however, have high temp. coeffs. and at the h. p. of liquid NH_3 very few salts are perceptibly sol. in any of the amines. One of the most striking properties of the amines is the ease with which they form aminates, usually immediately on coming in contact, in the cold, with the solute. Often these aminates are very sol. at room temp. but in other cases they are insol. or very slightly sol. at room temp.; as a rule they are sufficiently sol. to go over slowly to a cryst. structure, the crystals often attaining considerable size. CHAS. A. ROUILLE

The art of writing scientific reports. F. H. NORTON. *Sci. Monthly* 11, 548–54 (1920).

Need of professional solidarity among chemists. H. C. PARMELEE. *Hexagon*, Sept., 1920; *Chem. Met. Eng.* 23, 1113–4(1920).—An address reviewing the status of chemists as related to the general welfare of their profession, and as to their duty to the community and the nation. R. J. C.

Development of thermionic valves (GOSSLING) 4. The Cooper-Hewitt quartz lamp and ultraviolet light (BUTTOLPH) 4. Measurement of the diffusion of light by argon (CABANNES) 3.

3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

GERALD C. WENDT

Mass spectra and the atomic weights of the elements. F. W. ASTON. Cambridge Univ. *Sci. Progress* 15, 212–22(1920); cf. *C. A.* 14, 3578.—An outline is given of the technic for the production and measurement of mass spectra, and of the results obtained with Ne, Cl, A, H, He, Kr, X, and Hg. All masses, at. or mol., element or compd., thus far measured by this method are whole numbers on the O scale within approx. 0.05 or less. Many, probably the majority, of the elements are mixts. of isotopes. "The only fact which appears to limit the number of isotopes of 1 element is that, given any number of positive and negative charges with which to build a nucleus having the necessary excess positive charge, only a few of the possible configurations will be stable enough to exist at all. Partially stable arrangements would correspond to radioactive elements. These considerations lead one to expect that the greater the total number of positive and negative charges, the greater the number of stable or partially stable configurations which can be built with them. So that the higher the at. wt. of an element, the more isotopes it may have, and the greater the chance of some of these being radioactive. Both these conclusions are in accordance with experience." A table of elements and isotopes (including the masses of the latter) is appended.

JOSEPH S. HEPBURN

The ionization and resonance potentials of nitrogen, oxygen and hydrogen. F. L. MOHLER AND PAUL D. FOOTE. *J. Optical Soc. Am.* 4, 49–54(1920).—By means of a method

previously used in measurements on metallic vapors (*C. A.* 12, 18), the resonance potentials of N, O and H were determined respectively as 8.18, 7.91 and 10.4 v.; and the ionization potentials of N, O, H₂ and H as 16.9, 15.5, 16.5 and 13.3 v. These are in good agreement with the values computed from Bohr's theory.

G. R. FONDA

Two simple lecture table experiments demonstrating the electric wind. VICTOR F. HESS. *Physik. Z.* 21, 510-3 (1920).—Two brass electrodes are placed in the ends of a rectangular wooden box, whose sides are provided with glass windows. They are so arranged that the distance between them may be adjusted, the length of the box being about 10 cm. Through three holes in the top of the box, symmetrically placed with respect to the plates, three glass tubes project from the nozzles of which issue slow streams of air laden with NH₄Cl smoke. A plate of polonium is attached to one or the other of the electrodes, and an electrical field of from 200 to 500 volts is applied between them. In the absence of the field the smoke descends nearly vertically, gradually leaving the box through a screen at the bottom. On turning the field on, the streams of smoke are deflected away from the plate with the Po, irrespective of the direction of the field as the velocity of the wind is greatest at the end remote from the point of most intense ionization. Placing the Po plate in the bottom of the box and at its center causes the central smoke jet to divide in two parts, each half going to the electrode nearest it. This is due to the fact that where the ions are moving in opposite directions the wind pressure is least. Once away from the source of ionization the ions of one sign predominate and in their course through the gas they set up air currents in this direction of motion. The expt. can be modified by replacing the Po source by an incandescent oxide-coated filament. It may also be modified by replacing the smoke jets by a light vane of Al foil placed in the center of the box, provided with a scale to measure the deflection produced by the wind.

L. B. LONG

Effects of electron collisions with atmospheric neon. FRANK HORTON AND ANN C. DAVIS. *Proc. Roy. Soc. 98A*, 124-46 (1920).—An investigation of ionization and radiating potentials of pure Ne (*C. A.* 14, 3361). This was purified by Aston by repeated fractionation, and was considered very pure. The app. and methods used were essentially the same as those used in previous investigations except that the large ranges of pressures of Ne and large variations of the intensities of the electron stream here used required some changes in the method of correction for the effect of the initial velocity of electron emission. The results obtained are as follows: Minimum radiating velocity, 11.8 v.; second radiating velocity, 17.8 v.; minimum ionizing velocity, 16.7 v.; second ionizing velocity, 20.0 v.; third ionizing velocity, 22.8 v. The presence of two radiating and three ionizing velocities below 25 volts is rather surprising in view of the previous results in He and Ar. The second radiating velocity and one of the higher ionizing potentials could be due to the displacement and removal of a second electron. Some of the results obtained however indicate that this is not the case. As no impurities could be detected by the spectroscope and in view of the exceptional care in the preparation of this gas an effect due to impurities is unlikely. Expts. make it seem probable that the radiation at 11.8 v. and the 16.7 v. ionization go together, while the radiation at 18.8 v. and the ionization at 22.8 v. seem to be linked. The possibility of this effect being due to two isotopic neons is considered but dismissed. Attempts are being made to see whether there are spectral lines present when the 22.8 volt ionization takes place which are not present when the 16.7 volt ionization occurs. Although there is no evidence available for the region of the spectrum which includes the frequencies calcd. from the observed critical electron velocities, the existing spectroscopic evidence is in accord with the values obtained from the minimum radiating and ionizing potentials.

L. B. LONG

Investigation of the continuous Roentgen spectrum of cathode glow tubes: The predominance of the limiting ray on the azimuth of emission and the influence of the metal

of the anticathode. **GUSTAV ZECHER.** *Ann. Physik* 63, 28-56(1920).—An investigation to distinguish between the two current views as to the origin of the continuous X-ray spectrum by means of observations of the hardness of the rays at different azimuths; and to find whether or not the character of the rays is affected by the metal of the anticathode. The view that the rays are due to a damping effect leads to the superposition of an unsymmetrical distribution of intensity and hardness. The spectrum was analyzed by means of spectrographs of the Seemann type. To test the distribution simultaneous exposures were made on the same tube at different orientations. The hardness, (length of the limiting ray) was found to depend on the orientation in the manner predicted by the theory that the rays are due to damping. This theory is outlined in some detail. The shortest wave length was $\lambda 0.16\text{\AA}$. in a direction 60° from the path of the cathode particles, and 0.18\AA . at an angle of 210° from this path. This difference is explained as a Doppler effect, the excitation of the X-rays being ascribed to the moving particles. To study the effect of the metal of the anticathode two Coolidge tubes were operated in series, as nearly as possible under identical conditions. Their spectra were observed by means of similar spectrographs. The anticathodes were respectively W and Mo. The latter tube gave a slightly shorter limiting wave. Yet Z. thinks that the small difference might be due to the characteristics of the individual tubes. The difference was not in the expected direction. **K. BURNS**

Production of X-rays by cathode rays in air of ordinary density. **WALThER WOLFF.** *Physik. Z.* 21, 507-13(1920).—Cathode rays from a Lenard tube produce X-rays, detectable by their ionizing effect, when they fall on metals. **F. C. HOYT**

Explanation of X-ray spectra. **A. Smekal.** *Physik. Z.* 21, 505-6(1920); cf. *C. A.* 14, 2581.—A criticism of Vegard's work (*C. A.* 13, 1870). The ability to predict some of the X-ray frequencies as functions of the atomic number does not prove the existence of plane electron rings, as V. supposes. **F. C. HOYT**

Size of ions and the energy of the space lattices of the alkali halides. **K. FAJANS** AND **K. F. HERZFIELD.** *Z. Physik* 2, 309-31(1920).—Born and Landé (*C. A.* 13, 1557) have obtained for the potential energy of a cubic alkali halide lattice $(m/r) - (q/r^n)$, where r is the lattice distance, q and m are constants, and n is an integer. For the internal energy they found $(5.76 \times 10^{-8})(n-1)/nr$ kg. cal. per mol. As the agreement with thermal data is not satisfactory (*C. A.* 13, 1962), F. and H. with different assumptions as to the electron arrangement get for the energy $U = 3.305 \times 10^{-8} [(1.548/r) + (8.556(k^4 - a^4)/r^4) - (2.370(k^4 - a^4)/r^2)]$ kg. cal. where k and a are the "radii" of cation and anion, and can be evaluated from the known dimensions of crystals and the equation for elec. equil. of the electrons, d (potential energy)/ $dr = 0$. In this way the energies of all salts are calcd. and agree well with thermal data. The theory also gives correct values for the compressibilities. **F. C. HOYT**

X-Ray "asterism" on Laue photographs. **G. AMINOFF.** *Geol. Fören. Forh.* 41, 534-8(1919).—A. reviews the work on photographs (in English) and suggests that the deformations due to slight movements of the atom planes with some consequent change to tautozonal planes may account for the change of spots into stripes on the photographs. Certain Mg and Mn minerals are used as examples. **W. SEGERBLÖM**

Investigation of crystal structure by the Debye-Scherrer method. **N. GROSS.** *Umschau* 34, 510-4(1920).—G. describes in a semi-popular article an app. for the investigation of crystal structure by means of X-rays on crystal powder. It consists of a cylinder whose inner wall is lined with a photographic film, with a tube 1 mm. in diam. filled with the powdered crystals forming the axis. A narrow opening in the cylinder wall admits a narrow pencil of X-rays which impinge on the crystal powder. The result is a series of dark bands whose distance from a central position and whose density make possible the detn. of the crystal structure. Charcoal has been investigated and found to have bands identical with those of graphite; Au and Ag salts gave bands identical

with those of the respective metals. Quartz glass and gelatinous SiO_2 proved to be amorphous. Cf. Hull, *C. A.* 12, 649.

OTTO VON SCHLICHTEN

Experimental researches on X-rays of long wave length. HOIWERCK. *Compt. rend.* 171, 849-52 (1920).—The radiation is produced by impacts of electrons, emitted by an incandescent cathode, upon an anode. The accelerating field existing between the two electrodes is given by electrical storage batteries. The X-ray tube is highly evacuated and soft X-rays are transmitted through a celluloid window (2×10^{-4} cm. thick) into an ionization chamber where they are detected with the aid of an electroscope, an electrometer or a quartz piezo-electrical apparatus. The results are: (a) Soft X-rays are produced when a potential difference of 70 volts exists between cathode (tungsten) and anode (copper covered, by cathodic sputtering, with a film of tungsten soon after the apparatus begins to operate). The quantum relation indicates that this radiation has wave length of 175×10^{-4} cm. (b) Investigation of the dependence of ionization current on the potential in the range 120 to 600 volts showed that the current increased rapidly with potential above 300 volts. Different gases in the ionization chamber gave identical results. (c) The nature of the anode, whether of carbon, aluminium or copper, has no effect on the intensity and nature of the radiation. This result is in contradiction with that of Laird and Barton (*C. A.* 14, 2583) who claimed to have produced the characteristic K radiation of carbon. (d) The coefficient of absorption of soft X-rays in nitrogen is given. W. F. MEGGERS

Origin of chemical energy. M. POLANYI. *Z. Physik* 3, 31-5 (1920).—The radiation theory of chemical reaction is rendered improbable by the large absorption coefficients required if Kirchhoff's law is to hold. P. suggests that something like the quantized interchange of energy between matter and ether may also occur directly between two molecules in chemical reactions. F. C. HOYT

Characteristic infra-red frequencies of ammonium salts. O. REINKOBER. *Z. Physik* 3, 1-8 (1920).—R. measures intensity of reflected beam from 1 to 16.5 μ for NH_4Cl , NH_4F , NH_4Br , NH_4I , $(\text{NH}_4)_2\text{SO}_4$, and NH_4NO_3 . There are characteristic frequencies of the NH_4 at 3.2, 5.8, and 7 μ . NH_4NO_3 shows, besides the known nitrate frequency, a very weak frequency at 9.7 μ . F. C. HOYT

The splitting of infra-red characteristic frequencies in doubly refracting crystals. R. SCHACHENMEIER. *Z. Physik* 3, 26-30 (1920).—The characteristic frequencies for the same radical in different crystals varies slightly, and is split into two polarized partial frequencies in anisotropic crystals. S. is able to partially account for this by supposing the oscillators to be in an asymmetrical gravitational field, and applying the results of general relativity. F. C. HOYT

The effect of a magnetic field on the intensity of spectrum lines. H. P. WARAN. *Proc. Cambridge Phil. Soc.* 20, I, 45-9 (1920).—A study of the effect of a magnetic field on the intensity of the lines in various spectra. The source was a vacuum tube excited by an induction coil. The capillary passed between the poles of a magnet, giving a field of 5000 c. g. s. units. At a low pressure of gas, the brighter lines of Hg and H were visible. On applying the field a new set of lines was observed, the Hg line at $\lambda 6152\text{\AA}$ being quite brilliant. The field caused the nebulous lines and the bands to disappear, but had little effect on the ordinary line spectrum. The helium spectrum was greatly enhanced by the field. A trace of He in air at 1 mm. pressure did not show any lines until the field was switched on, but in the field the He lines were prominent although the lines of H and the other gases of the air were weakened by the slight resulting reduction of current strength. The Ne spectrum was enhanced in the same manner as He. The field thus seems to strengthen the spectra of monatomic gases and leaves the spectra of diatomic gases unaffected. The affected line of Hg is supposed to be due to the atom and the unaffected lines are ascribed to the mol. The spectra of N and O were not affected by the field. It is suggested that some of the lines which

are strengthened in sun spots may be enhanced by the fields which are known to exist in the spots. The paper is illustrated by plates which show the phenomenon in question quite plainly.

K. BURNS

Similarity between the spark spectra of the alkaline earths and the arc spectra of the alkalies. ERWIN FUSS. *Ann. Physik* 63, 1-27 (1920).—A confirmation of the "shift principle" put forward by Kossel and Sommerfeld (*Ber. physik. Ges.* 21, 240 (1919)) containing a graphical method of computing the Ritz formula of spectral series, and concluding with a table of the known series lines in the spectra of the alkali metals and earths. F. first discusses the literature of the subject and points out that the Rydberg constant must be increased by the factor 4 in order to represent the series in the spark spectra of the elements in question. It is further noted that the chief constant in the denominator of the series formulas is just twice as large in the case of the spark spectrum as in the arc spectrum of the same element. It is then shown that, within the accuracy of existing observations, the doublet series of the earths bears the same relationship to the doublets of the alkalies as that found between the spark and arc spectra of the same element. Thus the "shift principle" is fully established. The bearing of these facts on the quantum theory of atomic structure is discussed.

K. BURNS

General spectroscopic laws, in particular a magneto-optical separation law. A. SOMMERFELD. *Ann. Physik* 63, 221-63 (1920).—The author assumes the reader to be familiar with a previous article (cf. *C. A.* 14, 3187) which discussed the spectrum of hydrogen and similar elements, and the nature of the H atom. The present paper deals with the more complicated spectra and points out laws that apply to all. The writer has collected and developed much well-known matter, particularly by a recently discovered law of great importance—the magneto-optical separation law. After a clear outline of the nomenclature used in series formulas, the "permanence of multiplicities" is taken up. This law states that whenever the principal series consists of doublets or triplets the diffuse subordinate series is of like character. The sharp series is always single, whatever the character of the other series. As a particular case, the combination of a principal with a diffuse term leads to Rydberg's "complete" doublets and triplets. The combination of a doublet and triplet term has never been observed. A discussion of the literature of the Bergmann series ends with the conclusion that the multiplicity of no member of this series has been established. The type of combination which has been observed leads to the second law, the "principal of choice." By Rubinowicz's rule, the change of configuration of the atom takes place in such a manner that the quantum number is varied by $-1 + 1$, or 0. Associating the numbers 1, 2, 3 and 4 with the sharp, principal, diffuse, and Bergmann series respectively, it is seen that combinations of the principal and diffuse may be found, but not of the diffuse and sharp. An analogous appearance of choice is seen in the combinations of doublets and triplets. Denoting the components of a doublet by the subscripts 1 and 2, and those of a triplet by 1, 2 and 3, it is found that d_1 combines with p_1 but not with p_2 , while d_2 combines with both p_1 and p_2 . Similarly in the case of the triplets, d_1 combines with p_1 only, d_2 with p_1 and p_2 , d_3 with p_1 , p_2 and p_3 . The bearing of these facts on the quantum theory of atomic structure is considered at some length. Under the heading "Spectroscopic Displacement Law" S. reviews the recent articles by Fues (preceding abstract). A close relationship is established between the spark spectra of the alkali earths and the arc spectra of the alkalies. The series formulas further indicate that the spark spectrum is associated with a doubly ionized atom. This last consideration leads to a change in Rydberg's rule, which states that elements of uneven valence give rise to doublet systems and those of even valence to triplet systems of series lines. For "valence" must be substituted "number of outer electrons in the actual state of ionization." The magneto-optical separation law. It has been found that both the electric and magnetic dis-

placement of many combination lines is the difference of the displacements of the components. The normal Zeeman effect is the same for all single lines. Runge has found that the abnormal Zeeman effect is always a rational fraction of the normal displacement and that the denominator is the same for all members of the same series in the same or related elements. The numerator varies with the term of the series, always being a whole number. Denoting the normal displacement by H and the fraction proper to a given series by q over r with a subscript, the separation of a combination line is found to be $\Delta\nu = [(q_1/r_1) - (q_2/r_2)]aH = [(q_2r_1 - q_1r_2)/r_1r_2]aH$. In other words the Runge denominator separates into factors which are the denominators of the series combining to form the line in question. A study of the literature of the Zeeman effect shows that the denominator is 1 for all single lines; for triplets it is 1, 2 and 3 respectively in the sharp, principal, and diffuse series; for doublets the numbers are 1, 3 and 5 in the sharp, principal, and diffuse series. The seeming chaos of the Zeeman effect is thus reduced to a simple symmetry. S. outlines the method of predicting the number and displacements of the components of a line from the knowledge of its combination factors. The working of this law is treated in detail in the case of the Ne spectrum. Aside from being an excellent review of the subject, the paper contains many valuable ideas on spectral series and atomic theory.

K. BURNS

Spark spectra of several elements in the extreme ultraviolet. LÉON AND ÉDOUARD BLOCH. *Compt. rend.* 171, 709-11 (1920).—The spectrograph prism of fluorine which was used to obtain spark spectra in H at atmospheric pressure, was described before (C. A. 15, 209) and some new lines of Cd, Bi, Ni and Ag were given in the Schumann region (C. A. 15, 209). The present note describes the spark spectra of Sb, As, Bi and Sn between 1810 and 1400 Å. Twenty-four new lines for Sb are given between 1869.6 and 1540.6 Å. and 31 for As from 1854.4 to 1558.4 Å. For Sn 12 lines, 4 of which are new, are observed in the interval 1830.3 to 1401.1 Å., and 29 lines, 13 new, are given for Bi extending from 1823.5 Å. to 1390.9 Å.

W. F. MECHERS

The absorption of light by elements in the state of vapor: selenium and tellurium; mercury, zinc, cadmium, phosphorus, arsenic, antimony. J. J. DOBBIN AND J. J. FOX. *Proc. Roy. Soc. (London)*, 98A, 147-53 (1920).—In a previous paper dealing with S (C. A. 13, 1965) it was shown that interesting information as to the constitution in the state of vapor of those elements which are solid or liquid at ordinary temperatures can be obtained from an examination of the absorption spectra. The method is now applied to other elements of the S group, the Hg group and the P group, being limited to those elements which do not attack silica at a high temp. and volatilize below 1300-1400°. Se and Te like S produce absorption spectra of many narrow and sharp bands, and wave lengths for these are given. The temp. for max. absorption of Se lies very near that of S, *viz.*, 650° and the vapor density at that temp. indicates 3 atoms per molecule. It is inferred that the constitution of Te vapor at 1250° is analogous to that of S and Se at 650°. Considered as a group, Hg, Zn and Cd differ widely from S and resemble each other in that: (1) They show no general absorption at any temp.; (2) increase in temp. is not accompanied by increase in absorption followed by decrease as the temp. is raised; (3) doubling the quantity of the element has little influence upon the spectrum. P, As, and Sb, which are known from their vapor densities to be tetratomic, show an increase in general absorption with rising temp. and also when larger amounts of material are used. It is well known that the density of P, As and Sb vapor diminishes with increase of temp. and it is therefore assumed that, as in the case of S, the increase of absorption which takes place when the temp. is raised is closely associated with the breaking down of the more complex mols. No absorption bands or indications of selective absorption were observed in the elements of this group. The elements which lend themselves to this method of absorption spectrum analysis, may be divided into 3 groups: (1) Elements whose vapors exercise no absorption or

show only a few well-defined absorption bands; these are monatomic, *e. g.*, Hg, Zn, Cd. (2) Elements in which the absorption gradually increases as the temperature is raised, but which show no other effect within the limits of temperature imposed; these are tetratomic, *e. g.*, P, As, Sb. (3) Elements in which the absorption increases with increase of temperature to a maximum and afterwards diminishes. The sulphur and halogen elements belong to this group. The explanation of the different behavior as regards absorption of light, as exhibited by elements of groups (2) and (3) compared with those of group (1), is probably to be found in the rearrangement of the valencies accompanying the breaking down of the complex molecules under the action of heat. The tetratomic molecules would appear to break down simply into diatomic molecules, although possibly more complicated changes may take place at bigger temperatures than can be employed with silica tubes. With the sulphur and halogen elements, the changes are obviously much more complex. The molecules near the temperature of volatilization are probably already broken down, partially to the atomic condition, the liberated atoms forming new combinations with one another or with the undisassociated molecules, in other words, polymerizing. This subject will be more fully discussed in a future communication on the elements of the halogen group. W. F. MCCORMICK

A contribution to knowledge of the spectrum of neon. K. W. MEISSNER. *Ann. Physik* 58, 333-74 (1919); cf. *C. A.* 12, 1947.—Measurements with high dispersion of the Ne spectrum from 7000 Å. U. to 9000 Å. U. For the visible region commercial or bathed panchromatic plates were used, for the infra-red plates sensitized with dicyanin, A. For an exact wave-length detn. of new lines the following procedure was followed: (1) Strong lines were photographed using a plane grating in comparison with Fe and Ag normals, allowing measurements to 1/10 Å. U. (2) These rough approximations were corrected by measurements with a Fabry and Perot interferometer, giving accurate normals (3). Weaker lines were standardized on these normals by use of a Rowland concave grating of high dispersion. The data are presented in a table of intensities, wave lengths in air, and wave numbers *in vacuo*. Regularities in the Ne spectrum are then discussed in terms of the Ritz combination principle. In particular evidence is given of the existence of 8 series groups, closely connected, and forming the first subordinate series of an "octet" system, assumed to be analogous to known doublet and triplet series. S. E. SHEPPARD

The spectrum of neon. F. PASCHEN. *Ann. Physik* 60, 405-53 (1919); cf. preceding abstract.—The work of Watson, Rossi and Meissner has shown that the Ne spectrum gives a brilliant confirmation of the Ritz combination principle. P. has made a very complete investigation of the spectrum from the infra-red to the ultraviolet at 2550 Å. U. beyond which point lines appeared absent. The data allowed ordering of all the stronger lines, and the series could be mathematically represented with a completeness only possible in a few other cases. Certain new phenomena in spectral series were observed. Notably not only are the known and proven series of the Ritz formula type present but others, in conformity with the general combination principle, but not representable by any known series formula. Thus the series type of Ritz has the property that the quantity $f(m)$ of the expression $\text{Term} = N/(f_m)^2$ approaches, with increasing value of m , asymptotically to $m + a$, where a is a constant. But for the new type of series $f(m) - m$ does not approach a constant value a , but increases ever more rapidly with increasing m ; it can be approximately represented by addition of a further term of the form of (e^m) to the Ritz expression for $f(m)$. A very complete table of wave lengths of the Ne spectrum is given, from Å. U. 9840 to Å. U. 2550, beside tabular series analyses of the data. S. E. SHEPPARD

The spectrum of neon. (Addendum.) F. PASCHEN. *Ann. Physik* 63, 201-20 (1920).—P. has previously shown (cf. preceding abstract) that all but 60 of the 857 lines in the Ne spectrum are expressible as the difference of certain combination terms, and from the

computed "head" of one series it is possible to evaluate all of these combination terms. They were shown to be capable of arrangement in a number of series sequences, part of which follow ordinary spectral laws (such as Ritz law) while others (contrary to Meissner's conclusions) follow an entirely different sequence. There was perfect mathematical analogy with the principal and two subordinate series of other spectra, save that the complexity is much greater. There were four or more series of each type, and each term of each series was composed of from four to ten members. The intensity distribution was somewhat different from that found in ordinary line series and certain groups of series showed regular "perturbations" analogous to those found in band spectra. In this paper the previous contradiction of Meissner's conclusions is withdrawn, and it is found that by adding a constant frequency "*A*" to certain of the combination terms which form the heads of series, all the series obey the Ritz law, and have the other (mathematical) characteristics of spectral series. The Ne spectrum, as corrected, consists of forty principal series, in sets of ten each (*i. e.*, ten *p* terms) converging upon four different heads (*i. e.*, four *s* terms). The frequency differences of these four heads constitute the well-known constant frequency differences of neon, while nearly all the strong lines in the red portion of the spectrum compose the first term of the forty different principal series. There are one hundred first subordinate series in sets of ten each (*i. e.*, ten *d* terms) converging upon ten different heads (the ten *p* terms), as well as two series of satellites. Finally, there are forty second subordinate series, in sets of four each. The number of different "heads" is really greater than here indicated, due to the fact that in some cases the constant "*A*" must be added to the value expected on the combination principle. Because of the unexpected and unexplained appearance of this "*A*" term, there is not a perfect analogy with other series systems, in contradiction to the conclusion of the previous paper.

R. T. BIRGE

Is the existence of intermediate states in the phosphorescence of calcium sulfide deduced from the study of its conductivity? P. VAILLANT. *Compt. rend.* 171, 713-4 (1920).—Under the action of light from an incandescent lamp the conductivity of CaS rises to a maximum and then decreases (*C. A.* 6, 826; 7, 1135). After returning to darkness an analogous variation is produced, but in the inverse sense. Larger variations are observed with sunlight, especially if a preliminary heating has destroyed all trace of phosphorescence. Under the action of green light, a max. cond. is observed and followed by a more rapid decline. If CaS is returned to darkness after a prolonged exposure to light, its conductivity increases rapidly at first, attains a max. after several hours and then decreases slowly. If the exposure to light is stopped in the first phase and the material returned to darkness, its cond. continues to increase and passes through a max. These laws make it necessary to suppose that under the excitation, which produces phosphorescence passes successively through states 2 and 3, in which 2 is more conductive than the initial state 1, and 3 less conductive than 2. One may imagine that the passage 1-2 liberates electrons which are regained in the passage 2-3 without returning to the initial state, however. During the period of darkness the same double passage occurs but in the inverse sense. W. F. MEGGERS.

A special form of phosphoroscope. W. S. ANDREWS. Gen. Elec. Co. *Gen. Elec. Rev.* 23, 856-7 (1920).—In the new form of phosphoroscope which has been designed for spectrographic analysis, there is employed a paper ribbon, coated with the phosphorescent material, which is fastened around the periphery of a small flat-faced wheel attached to the shaft of an elec. motor. This wheel is placed between the source of exciting rays and a small window of a metal screen. The rays excite the adjacent material on the rim of the wheel, and as the latter revolves the excited portion is carried around continuously opposite the window, where the phosphorescent light of the material can be photographed. Photographs of the phosphoroscope and of the phosphorescent light emitted by various materials are given in the paper. H. J. C.

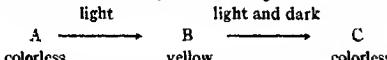
Measurement of the diffusion of light by argon. A new determination of Avogadro's constant. J. CABANNES. *Compt. rend.* 171, 852-4 (1920).—The ratio, R , of the intensity of light diffused laterally to the intensity on a plane normal to the incident beam was found for the radiation 4358 of Hg vapor to be $1.34 \times 10^{-4} \text{ cm.}^{-1}$. Applying Lord Rayleigh's theory (*Phil. Mag.* 47, 375) Avogadro's number is caled. as $(6.9 \approx 0.25) \times 10^{24}$.

A. E. STEARN

The application of photoelectric cells to the measurement of light absorption in solutions. HANS VON HALBAN AND HERIBRANT GRIGEL. Univ. Würzburg. *Z. physik. Chem.* 96, 214-32 (1920).—An arrangement is described and illustrated diagrammatically, by means of which light absorption in soln. can be rapidly and accurately ascertained with the help of photoelec. alkali metal cells. It has been shown that, with a const. source of light (nitra lamp) and a Na or K photoelec. cell, the method may be applied to measurements in the spectral region between 300 and $630 \mu\mu$. If a quartz lamp is used as the source of light, the arrangement described may be advantageously employed for measurements in the ultraviolet up to $255 \mu\mu$. In illustration of the application of the method, the results of detns. of the extinction coeff. in solns. of yellow $(\text{C}_6\text{H}_5\text{CO})_2\text{C}:\text{C}(\text{C}_6\text{H}_5\text{CO})_2$ and of C_6H_{10} are given.

H. JERMAIN CREIGHTON

The photochemistry of tetrabenzyloethylene. I. HANS VON HALBAN AND HERIBRANT GRIGEL. Univ. Würzburg. *Z. physik. Chem.* 96, 233-50 (1920); cf. preceding abstract.—The turning yellow of colorless $(\text{C}_6\text{H}_5\text{CO})_2\text{C} = \text{C}(\text{C}_6\text{H}_5\text{CO})_2$ in the presence of light is not a reversible process. A new colorless substance is formed by decolorization in the dark, which does not turn yellow again on exposure to light. The same substance is probably formed in the light by a relatively rapid light reaction. The foregoing processes are indicated by the following scheme:



The substance B, which has been isolated, has the same mol. wt. as A. The absorption spectra of the 3 substances have been detd. photographically, and in addition that of B by the method referred to in the preceding abstract. The course of decolorization in soln. ($\text{B} \longrightarrow \text{C}$), both in the light and in the dark, has been followed by the same method. The reaction in the dark is of the 1st order, its velocity depending markedly on the nature of the solvent and increasing in the presence of acids. While O markedly retards decolorization in the light, it exerts no influence on the rate of decolorization in the dark nor on the velocity of formation of B in the light. The light reaction, $\text{B} \longrightarrow \text{C}$, is also of the 1st order, but with even weak radiation its velocity is much greater than the dark reaction.

H. JERMAIN CREIGHTON

The gaseous hydrides of polonium, etc. (PANETH) 6. The rate of diffusion of melted lead (GROH, HESSEY) 2. Development of thermionic valves (GOSSLING) 4.

Radium salts. H. O. HEDSTRÖM. Brit. 149,552, Oct. 20, 1919. See U. S. 1,338,831 (C. A. 14, 1782).

4—**ELECTROCHEMISTRY**

COLIN G. PINK

Dr. Elihu Thomson. DUGALD C. JACKSON. *Gen. Elec. Rev.* 23, 983-4 (1920).—Biographical sketch. C. G. P.

One hundred years since Oersted, Ampère and Arago. ELIHU THOMSON. *Gen.*

Elec. Rev. 23, 975-82(1920).—Historical sketch including many personal reminiscences. See abstract below. C. G. F.

The epoch-making discoveries of the years 1819 and 1820. ELIJAH THOMSON. *J. Am. Inst. Elec. Eng.* 39, 1021-8(1920).—Oersted and Ampère's discoveries. M. I. PUPIN, *Ibid* 39, 1028-30. The centennial of the discoveries of Oersted, Arago and Ampère. C. E. MAGNUSSON, *Ibid* 39, 1031-3(1920). C. G. F.

Janssen Medal awarded to Dr. W. W. Coblenz. ANON. *Elec. World* 76, 1279 (1920).—Includes a brief biographical sketch. C. G. F.

The electrochemical industry. A. H. W. ATEN. *Chem. Weekblad* 17, 433-4, 441-4, 450-1, 461-3, 482-4, 493-6, 508-10(1920).—Electrolysis, elec. furnace operations and synthesis by elec. discharge through gases are discussed as the principal divisions of electrochem. industry. References are given. JULIAN F. SMITH

The electrochemical and electrometallurgical industry of Switzerland during 1919. ANON. *Mon. sci.* [5] 10, 179-80(1920). E. J. C.

History of the electric furnace. JOS. W. RICHARDS. *J. Am. Inst. Elec. Eng.* 39, 1034-6(1920). C. G. F.

The future prospects of electric smelting of iron in British Columbia. R. C. CAMPBELL-JOHNSTON. *Mining J.* 128, 206-7(1920).—High-quality gray pig Fe, free from S, has been produced in Vancouver by elec. smelting of British Columbia magnetite. The elec. furnace was kept charged to near the top and was tapped whenever the bath rose to the level of the electrodes. Some charcoal was used for fuel and a blast was blown into the furnace to supply O for combustion and to distribute the heat from the arc. No attempt was made at reduction in this furnace, but the melt was tapped into a sep. furnace for reduction at a lower temp. A discussion of costs is given.

A. BURTS

Induction electrical furnace. G. H. CLAMER. *J. Franklin Inst.* 190, 473-507 (1920); *J. Am. Inst. Elec. Eng.* 39, 1042(1920); *Brass World* 16, 337(1920).—The development of the induction furnace art is traced, and special attention is paid to its application in the brass industry. JOSEPH S. HEPBURN

Electricity for brass making in the Northwest. W. C. HESTON. *J. Electricity* 45, 522(1920).—A Detroit rocking furnace at the Oregon Brass Works has a capacity of 1000 lbs., 150 kv. a.; a second one has a capacity of 2000 lbs., 300 kv. a. Both are single phase. Electrodes are 4" graphite. First 2 mos. operation showed costs per 100 lbs. brass, for power: 26 c.; electrodes 3.1 c.; lining 4 c. Power consumption 13.1 kw. per 100 lbs.; metal loss, 2.34 to 2.81%. C. G. F.

Non-ferrous furnaces becoming very attractive. EDWIN L. CROSBY. *Elec. World* 77, 35-6(1921).—A review. C. G. F.

Behavior of copper anodes in alkaline solutions (telluric acid). FRANZ JIRSA. *Chem. Listy* 14, 8-10, 33-6(1920).—When a Cu anode was polarized in a soln. of 3 N KOH until O gas appeared, the presence of telluric acid did not cause the temporary depolarization of the anode as it did in the case of Ag anodes (C. A. 13, 3087). After the polarizing current was discontinued, the potential of the Cu|Cu₂O electrode, prep'd. without the addition of telluric acid, fell rapidly to zero whereas the potential of the same electrode in a KOH soln. to which telluric acid had been added remained const. This would indicate that the telluric acid had a stabilizing influence on the Cu₂O. The e. m. f. of the system, (Pt)Cu|Cu₂O, CuO.2K₂TeO₄, 7N KOH, Cu(OH)₂ in soln.—| N KCl, Hg₂Cl₂|Hg, was found to be +0.22 volt at 18°. The KOH soln. was subjected to electrolysis between Cu electrodes using an a. c. in an atm. from which the generated O was constantly removed by a current of H. The Cu went into soln. in the univalent state as Cu₂O. JOHN M. KIRK

Electrolytic zinc methods. HERBERT R. HANLEY. *Mining Sci. Press* 121, 795-804(1920).—H. deals with the technic of the process, with special reference to Zn

fume treatment. As oxide, one of the chief impurities of Zn fume, can be sep'd. by volatilization, if it is in the trivalent state and uncombined with other bases. This is accomplished by mixing 10-15% excess dil. H_2SO_4 , over, that required to combine with valuable metal bases that can enter into soln., and roasting this charge at 330-510°. This treatment destroys water-sol. As, and produces max. amt. valuable metal sulfates, which may then be leached by water or neutral solns. Arsenates and arsenites are often found in fume. The former give a gelatinous ppt. when neutralized and then acidified, causing trouble in filtering and washing. Care should be taken not to neutralize this pulp, and to filter in acid soln. (6-8 g. $H_2SO_4/l.$). If an acid deficiency exists, SO_2 gas, 8-10% by vol., may be substituted. Pressure filters are the only practical ones for fume, on account of the colloidal nature of pulp. Flocculated silica and Fe compds. may be filtered and rendered insol. in dil. H_2SO_4 , by dehydrating at 150°. Fe in soln. is best oxidized by MnO_2 , or atomized air. With the latter the pulp should first be filtered. In ptn. of Fe by lime 2-6 g./l. of Cd retards ptn., while 20 g./l. nullifies it. As Cd ppts., in the presence of a Zn soln. redissolve, it is best to make a double ptn., filtering each stage. Electrolytic ptn. of Cu and Cd from Zn solns. does not offer any advantages over ptn. by metallic Zn. Tables and graphs are given covering (1) kw. hr. for various current and v., also power cost per ton cathode, (2) voltage-current characteristics, (3) current efficiency of solns. containing small amts. Zn, (4) electrolytic ptn. of Cu and Cd from Zn solns., (5) relative rate of ptn. of Cu and Cd by metallic Zn, (6) ptn. of Fe by air alone, (7) washing data, (8) solv. of SO_2 in $ZnSO_4$ soln., (9) corrosion rate of cathode Zn, (10) treatment of acid-mixed fume in roaster.

A. H. HELLER

Contribution to the study of the phenomena of electrolytic migration. *Electrolysis of mixed solutions of alkali salts.* MARC H. VAN LAER. Brussels. *Rec. trav. chim.*, 39, 301-30 (1920).—All industrial electrolytic processes of manuf. of NaOH use NaCl. V. L. has investigated possibility of using Na_2CO_3 or K_2CO_3 in place of NaCl. Such a soln. on electrolysis should furnish free alkali at the cathode and bicarbonate at the anode. Experience showed that this is true, but the insolubility of the bicarbonate formed and the rise in voltage are obstacles to the production of conc'd. lytes. Some further tests showed that the harmful formation of bicarbonate can be avoided by using a 2nd electrolyte with a common cation, itself capable of furnishing free alkali at the cathode but incapable of producing at the anode anything like a temporary acidification of the anolyte. The sol. inorg. oxy salts: alk. sulfates, nitrates, chlorates, and perchlorates were used for this purpose. V. L. has exp'd. on the best conditions for obtaining a high cathodic concn. of alk. in an electrolyte fed with dil. alk. He then studied the electrolysis of solns. of Na_2CO_3 and the production of $NaHCO_3$ and NaOH. The new principle developed seems applicable to the direct production of cryst. $Ba(OH)_2$ from witherite; $Sr(OH)_2$ may be obtained similarly. $Al(ClO_4)_3$ was obtained by introducing powdered Al_2O_3 into the anodic compartment of a diaphragm cell containing $NaClO_4$. The exptl. details are given and discussed. The conclusions are briefly summarized. In the electrolysis of a 1 N NaOH soln. at 18° (OH ion transport no. 0.825) the current yield becomes $R = I - 0.825$ or 17.5% of the theoret. yield according to Faraday's law. But the yield is often different owing to the superposition of various reactions. The favoring influence of temp. and cataporesis is notable. The diffusion of the NaOH on the contrary entails a loss which increases as the catholyte concn. increases. Among the peculiarities of electrolysis of NaOH solns. is the relation between yield and the current-concn. factor of Muller. In proportion as the value i/e increases the yield at first increases, reaches a max. and then diminishes. The electrolysis of Na_2CO_3 soln. shows the same fundamental character as that of NaOH, but in this case, as the electrolysis proceeds the resistance of the cell increases due to the formation of $NaHCO_3$ and its ptn. The CO_2 liberated at the anode

is at the ordinary temp. absorbed entirely by the soln. if the current intensity is not too great. The addition of an inorganic oxysalt with a common cation to the carbonate hinders the formation of bicarbonate and permits of the direct formation of cathodic liquor very rich in NaOH (as much as 482 g. per l.). Of Na₂SO₄, NaClO₄ and NaNO₃ the addition of the last gave the best results in producing the purest NaOH, and a considerable improvement in the current yield.

E. J. WITZEMANN

The deposition of silver on glass. K. EYRAINER. *Das Metall* 1920, 260.

C. G. F.

Electrically heating without wires. H. S. BAILEY. *Cotton Oil Press* 4, No. 7, 42-4 (Nov. 1920).—Small thermostats and m. p. baths may be conveniently heated without the use of resistance wires by using the resistance of the soln. in the bath itself as the heating element. Electrodes of carbon are immersed, a suitable distance apart, in the water bath, the elec. current applied and H₂SO₄ added drop by drop until the conductivity of the soln. is such that at any desired temp. the radiation equals the heat input. Final adjustment is made by varying the distance between the electrodes. Cut of a m.-p. bath is given, showing the electrodes arranged to slide up and down in glass sleeves. This design makes it possible to change materially the length of the soln. conductor between the two poles so that the bath can be heated at any desired rate.

H. S. BAILEY

Battery-charging rheostat for use on 32-volt circuit. ANON. *Elec. Rev.* 77, 944 (1920).

C. G. F.

The Cooper-Hewitt quartz lamp and ultraviolet light. III. L. J. BUTTOLPH. *Gen. Elec. Rev.* 23, 909-17 (1920); cf. *C. A.* 15, 28.—The Cooper-Hewitt quartz burner is described and illustrated, and its spectrum is discussed. This spectrum extends from 1850 to 14,000 Å. The radiation from 4500 to 14,000, one-third of all the radiation of wave length less than 14,000, is largely concd. in a close pair of yellow green lines at 5764 and 5791 and a green line at 5461. For this reason the visible portion of the spectrum is of unique value as a source of high-intensity monochromatic light for polariscope, spectroscopic and interferometer work. The light of this lamp has a much greater intrinsic brilliancy than that of the Cooper-Hewitt lamp, and is rich in violet and ultraviolet radiations. The radiation of a wave length less than 4500 represents $\frac{1}{3}$ of the total radiation of wave length less than 14,000. Like the visible radiation, the ultraviolet is concd. in a few lines of high intensity. A pair of especially strong lines occurs at 3650-4, one at 3884 and a pair at 4046-78. The ultraviolet rays are screened out by ordinary crown glass, but are freely transmitted by quartz. The lamp is of great importance commercially in photographic and photochem. processes, and in the treatment of parasitic and tubercular skin affections. Its therapeutic effects are similar to those of X-rays but are less severe.

H. JERMAIN CREIGHTON

Ultraviolet ray apparatus of the Quartz Lamp Co., Ltd., Hanau. VON HEYGEN-DORFF. *Z. angew. Chem.* 33, I, 243-5 (1920).—Descriptions, with 6 cuts, of Hg-vapor double-walled quartz lamps for medicinal purposes, use in the manuf. of patent leather and artificial rubber, sterilization of milk, H₂O, etc. Cf. M. Geitel, *Z. deut. Technik* 1916, 42.

J. H. MOORE

Performance and life tests on the oxide film lightning arrester. N. A. LOUGES. *Gen. Elec. Rev.* 23, 928-33 (1920).—The performance of several hundred Pb oxide film arresters (cf. Steinmetz, *C. A.* 12, 1616) on transmission lines over a 30-month period has proved this type of lightning arrester satisfactory for all the requirements of service. Extensive lab. tests show a proper behavior as regards the important factors of sensitiveness, discharge capacity, reseal, and life. Practically no deterioration resulted from severe life tests during the past few yrs. Many illusts. are given, including those of a cell after 4 yrs. of actual service.

F. H. HORCHKISS

Surface creepage and high-voltage (porcelain) insulation. T. NISHI. *J. Am. Inst. Elec. Eng.* 39, 949-59 (1920).—Although the principles of electrostatics are fundamental to the design of high-voltage insulation, the erratic phenomena of "surface creepage" has caused present models to be based more upon experience than theory. The results of many expts. indicate that this creepage is due to accumulation of "free charge" on the dielec. surface, which latter is always accompanied by a corona discharge. Very similar behavior was found between paraffin, beeswax, ebonite, glass, mica (crystalline), varnished cambric, oiled cloth, and mineral oil, except that the latter ones dissipated free charge most rapidly. Discharge takes place through the layer of ionized air along dielec. surface. Points to be considered in design include: (1) whether a. c. or d. c.; high or low frequency; (2) a form giving max. of air insulation efficiency; (3) corrugations leaving intact zone with zero normal component of elec. intensity. Many special graphs and curves supply valuable and interesting data.

F. H. HORCHKISS

Determining corona voltages for actual lines. F. W. PEAK, JR. *Elec. World* 76, 1258 (1920).—After reviewing the laws underlying corona discharge and presenting the mathematical equations for the calculation of voltage and power loss, P. discusses safe and economical voltages, arrangement of conductors and the corona limit of voltage for various conductors. Limiting voltages are tabulated for cables from 0.584 up to 2.92 cm. in diam., and for single wires from 0.524 up to 1.17 cm. in diam. at various spacings.

C. G. F.

Development of thermionic valves for naval uses. B. S. GOSSLING. *J. (Brit.) Inst. Elec. Eng.* 58, 670-703 (1920).—A very comprehensive review.

C. G. F.

The electrolytic formation of the alkali salts of ferrous oxide and of ferric oxide (GRUENE, GMELIN) 2. The heat of formation of calcium cyanamide (DOLCH) 2. Industrial tar melanosis, particularly in the manufacture of dry cell batteries (ARNSTEIN) 11H. Refractories for electric furnaces (ANON.) 19. Varnishes for protection and insulation (ANON.) 26. Arc images in chemical analysis (MOTT) 7. Lead-silver alloy for electrical contact points (U. S. pat. 1,358,908) 9.

WILHELM: BORCHERS, *Die elektrischen Oefen*. Wilhelm Knapp. Halle an der Saale, Germany. 1920. 289 pp. 443 illus. 3rd enlarged edition.

Electric primary battery. G. K. THOMAS. U. S. 1,360,055, Nov. 23. Structural features.

Storage battery. D. W. DAVIS. U. S. 1,359,491, Nov. 23. Structural features.

Electric storage battery. M. LECHNER. U. S. 1,359,259, Nov. 16. Structural features.

Wood storage battery separator. O. C. HIRSCH AND A. R. HARNES. U. S. 1,358,207, Nov. 9. Wood is prepd. for use as separators in batteries by treatment with superheated steam under high pressure followed by treatment with an aq. soln. of H_2SO_4 .

Rubber storage battery separator. H. T. ROBERG. U. S. 1,358,576, Nov. 9. Structural features.

Electric batteries. H. F. FRENCH. U. S. 1,357,160, Oct. 26. To prevent undue reduction of acidity of the electrolyte of elec. batteries such as takes place by the dissolving action of an acid electrolyte on Zn anodes, various org. substances may be added to the battery materials. Among the substances which may be used are: CCl_4 , $CHCl_3$, C_6H_5Cl , trichlorophenol, ethyl chloride, bromide or iodide or other alkyl halides, acetyl chloride or other acid chlorides, benzyl chloride, benzal chloride, benzotrichloride, acetyl chloride, chlorohydrins, aniline hydrochloride.

Electric battery. H. F. FRENCH. U. S. reissue 14,984, Nov. 16. Structural features. Original pat. 1,303,286; *C. A.* 13, 1794.

Electric gas battery. P. A. EMANUEL. U. S. 1,359,881, Nov. 23. Structural features.

Dry-cell electric battery. W. H. SHEAHAN. U. S. 1,359,201, Nov. 16. Structural features.

Dry-cell electric battery. O. E. RUHOFF. U. S. 1,358,334, Nov. 9. Structural features.

Dry-cell electric battery. J. W. WEISS. U. S. 1,358,350, Nov. 9. Structural features.

Depolarizer material for dry batteries. C. ELLIS. U. S. 1,358,626, Nov. 9. The depolarizer material comprises pptd. slightly hydrated MnO₂ with a cond. lag of a greater order of magnitude than ordinary pure hydrated MnO₂ depolarizer material. The material may be prepd. by heating a soln. of Mn(NO₃)₂ with NaOCl with or without HNO₃ or other additional oxidizing agent.

Zinc battery electrodes. H. F. FRENCH. U. S. 1,359,244, Nov. 16. Zn battery electrodes are formed in molds heated to about the m. p. of Zn and the mold is cooled so that the Zn is solidified slowly in order to produce a coarse cryst. structure which is relatively non-hrittle.

Electrode for arc welding. J. W. FAY. U. S. 1,359,976, Nov. 23. An electrode rod of metal is coated with cement and with a wrapping of paper with a thin coat of cement penetrating into the pores of the paper and surrounding its outer surface and an overlying coat of thick cement.

Electrolytic cell. B. THOMAS. U. S. 1,359,002, Nov. 16. An electrolytic cell adapted for producing NH₄NO₃ from HNO₃ is formed with a diaphragm of arenaceous quartz which has been sintered together.

Diaphragm for electrolytic cells. M. W. KREJCI and G. E. JOHNSON. U. S. 1,358,858, Nov. 16. A diaphragm suitable for use in electrolytic cells for the production of Pb salts is formed of loose filaments of "rock wool" or similar vitrified material compressed to operate osmotically. Paraffin may be used as a binder.

Electric ozone generator. S. HEDD. U. S. 1,358,443, Nov. 9.

Electrolysis of anhydrous magnesium chloride. E. A. ASHCROFT. U. S. 1,359,654, Nov. 23. Dehydrated MgCl₂ is electrolyzed to produce Mg and Cl. The latter is absorbed in MgO emulsion to form Mg(ClO₄)₂ and hydrated MgCl₂ and the latter is sepd. and used for continuing the process.

Electrolytic apparatus for producing magnesium and its alloys and chlorine from anhydrous magnesium chloride. E. A. ASHCROFT. U. S. 1,359,653, Nov. 23.

Electrolytic cell adapted for producing sodium hypochlorite. E. A. LASURUR. U. S. 1,359,716, Nov. 23. Structural features.

Manganese chloride from spent dry-battery mixtures. A. A. WELLS. U. S. 1,359,640, Nov. 23. Spent mixt. from dry batteries is treated with HCl to dissolve Mn compds., carbonaceous material is filtered out, excess Cl and acid is boiled off from the soln., the latter is digested with freshly pptd. Mn carbonate to ppt. Fe and the ppt. is filtered out, leaving MnCl₂ in soln.

Electroplating apparatus. F. G. PURINTON. U. S. 1,359,273, Nov. 16.

Electroplating and stripping metal films. T. A. EDISON. U. S. 1,359,972, Nov. 23. Surfaces of Fe, Ni or Cu are prepd. for electroplating with Fe, Ni, Cu, Ag or similar metals by treating with selenious acid to facilitate stripping of the coating.

Furnace for electrical oxidation of gases. B. THOMAS. U. S. 1,359,932, Nov. 23. The furnace is especially adapted for fixation of atm. N.

Furnace for electrical oxidation of nitrogen of air or other gases. B. THOMAS. U. S. 1,359,933, Nov. 23.

Electric furnace adapted for producing magnesium from its oxide. C. E. PARSONS. U. S. 1,359,735-6, Nov. 23.

Tilting electric furnace. S. N. CASTLE. U. S. 1,358,617, Nov. 9. The furnace may be operated on a. c.

Electric arc furnace. T. M. HVIBSTEN and A. H. INGELSUD. U. S. 1,359,067, Nov. 16. The pat. relates especially to the mounting of the electrodes.

Insulating and heat-conducting material for electric heaters. R. W. EARL. U. S. 1,358,366, Nov. 9. An elec. insulating and heat-conducting material for elec. heaters is formed of a granular material of high dielectric strength and thermal cond. such as fused Al_2O_3 85% mixed with refractory clay 15% or similar bonding material of high dielectric strength and high fusing point and capable of forming a viscous mixt. with H_2O .

"Transformer grease." Y. TANAKA. U. S. 1,360,153, Nov. 23. A "transformer grease" is formed of a refined mineral oil 450, a viscous coagulating oxidized non-drying vegetable oil, *e. g.*, hempseed oil oxidized by air 100, colophony 50, turpentine 10, CCl_4 2.5, copal gum 10 and bitumen 15 parts. The mineral oil is preliminarily refined by successive treatment with pine oil, H_2SO_4 and Na silicate soln.

6—INORGANIC CHEMISTRY

H. I. SCHLESINGER

Action of very concentrated solutions of iodic acid on ammonia gas. G. DENNICK AND J. BARLOT. *Bull. soc. chim.* 27, 824-5 (1920); cf. *C. A.* 14, 2598, 3036.—Solns. more concd. than 10% tend to form needle crystals of diiodate or rhombic crystals of triiodate. When a droplet of 50% acid on the concave side of a cover glass is placed over 0.05 mg. NH_4 salt and alkali, the rhombic crystals will form within 1 hr. If a drop of 50% acid is placed a few mm. from a drop of NH_4OH on a slide, there are observed first square crystals of neutral iodate in small number on the edge of the drop, then needle masses of diiodate; among these clear cavities soon appear which fill with rhombic or hexagonal crystals of triiodate, often 1 mm. in length. A. R. M.

Colloidal double sulfide of iron and sodium. S. M. HORSCH. *Bull. soc. chim.* 27, 777-9 (1920).—By passing H_2S into a mixt. of $NaOH$ and Fe oxide a red product was obtained that dissolved in water to give an emerald-green soln. Analysis showed the compn. to be FeS_4Na_2S . The excess of Na_2S was removed by dialysis, whereby a gel was formed that dissolved in water to give a dark-colored soln. During dialysis oxidation was prevented by covering the surface of the soln. with liquid paraffin. By analysis the gel was found to have the compn. Na_2S_2FeS . By carefully adding small amts. of Na_2S soln. to the dark liquid the green color appeared when the compn. corresponded to FeS_4Na_2S . This colloidal soln. is stable only within certain limits of temp. and concn. Diln. or boiling causes a transformation to take place according to the equation $FeS_4Na_2S \rightleftharpoons 4Na_2S + FeS$. E. B. SPEAR

Colloidal sulfur compounds of ruthenium. F. M. JÄGER AND J. H. DE BOER. Groningen. *Proc. Acad. Sci. Amsterdam* 23, 95-102 (1920).—At lower temps., *i. e.*, 0°, quadrivalent Ru salts and $(NH_4)_2S$ give a greenish black ppt. which is sol. in an excess of the pptg. agent. The greenish soln. last named exhibits colloidal properties, the particles being negatively charged. It is rather unstable, flocculating completely on standing 24 hrs. The compn. of the colloidal substance corresponds to the formula RuS_6 . On long standing the color of the soln. and ppt. gradually passes from green to pink and finally becomes reddish violet. The reddish soln. was found to contain positively charged colloidal particles of ruthenium pyrosulfite, RuS_2O_10 . Air or oxidizing agents change this substance into ruthenium sulfate, $Ru(SO_4)_2$, and H_2SO_4 . The

pyrosulfite is a reversible colloid, for the soln. turns blue if acid is added, while the original red color is restored if the acid is neutralized by the addition of a base. Some further reactions of the pyrosulfite are also given.

E. B. SPEAR.

The gaseous hydrides of polonium, bismuth, tin and lead. FRITZ PANETH. Hamburg. *Z. Elektrochem.* 26, 452-4 (1920); see *C. A.* 14, 3374. H. J. CREIGHTON

The electrolytic formation of the alkali salts of ferrous oxide and of ferric oxide (GRUBE, GMELIN) 2.

7—ANALYTICAL CHEMISTRY

WILLIAM T. HALL

Arc images in chemical analysis. WM. ROY MOTT. *Trans. Am. Electrochem. Soc.* 37, preprint (1920).—A new method of chem. analysis has been formulated, which consists in bringing the materials to be tested into or under the influence of the carbon arc in a special manner. Full details are given. The major analytical resources of this method consist in: (a) Characteristic modifications in the appearance and behavior of the arc stream, and of the carbon craters. (b) The order of distn. of the materials under the influence of the heat of the arc. (c) The character, color, position and form of the distn. deposits upon the upper and lower electrodes, and the character of the residues. Also specific modifications of these appearances by addition of suitable reagents. (d) The application of ordinary analytical reactions to the deposits and residues after decompn., distn., or sepn. by the arc. The method has unique advantages in the analysis of all refractory materials, minerals and compds. the decompn. of which is most troublesome and tedious by the usual methods of analysis. The method has specific analytical advantages in the case of many of the less common elements, and of those offering special difficulties by present methods. It is of particular value in the case of the following elements: F, P, Cd, Zn, Ag, Au, Na, K, Ba, Ca, Sr, Mg, B, Be, Al, Ti, Zr, V, U, Cb, Mo, Ta, W, and the rare earth elements. The method is least applicable to the non-metallic elements. It is unavailable for acid radicals and org. compds. The delicacy of test ranges from 1/50 mg. for Ag, Au, and W, to 1/10 mg. for S, P, Cd, Pt, Cr, V, Ti, U, Yt, Zr, Th, Cb, Mo, and Ta. Most of the other elements can be detected in aunts. of 1 mg. The major constituent of any mineral, alloy, refractory or chem. ppt. can be readily identified in less than 10 min. Distinctive tests and analytical procedure for 65 elements are outlined.

C. G. F.

The use of membrane filters in chemical analysis. L. MOSER AND KIRTL. *Chem.-Ztg.* 44, 637-8 (1920).—M. and K. refer to the work of Zsigmondy and Jander (*C. A.* 14, 703), in which the use of membrane filters in the filtration of colloidal ppts. is suggested. It is also observed from the work of Zsigmondy, Wilke-Dörfurt and Galecki (*C. A.* 6, 1576), that filter membranes can be used to advantage in quant. analysis. M. and K. use a filtering app. similar to that used by Zsigmondy, with the exceptions that the curvature of the sieve plate was 6 mm. and the ring was 5.7 cm. high. M. and K. found these changes in the filtering app. to be distinctively advantageous, especially facilitating the washing and removal of the ppt. The colloidal soln. is filtered slowly, care being taken to prevent the soln. coming into contact with the rubber packing of the app. In washing the ppt. M. and K. suggest the use of 10-15 cc. portions instead of 25 cc. as suggested by Zsigmondy and Jander. The filtration operation, once started, is carried to completion owing to the susceptibility of such ppt. to crack and make inefficient subsequent washing. Care should be exercised in the removal of the ppt. from the filter membrane which often appears black with impregnated ppt. and in some cases, the original color only returns after treatment with moderately concd.

HNO_3 . While the speed of filtration through filter membranes is not comparable to that of filter-paper filters or correctly prep'd. asbestos filters, yet with the agency of suction, most colloidal ppts. filter fairly rapidly. An exception is ZnS , but M. and K. suggest a preliminary treatment for such a colloid which greatly increases its speed of filtration. The advantages of this method of filtration especially for such substances as colloidal Bi , Ag , ZnS and other hydrosols is pointed out. C. S. AOAMS

Treatment of red litmus paper. T. J. WARD. *Analyst* 45, 412(1920).—Sometimes red litmus paper contains so much resinous matter that it is not easily wet and is, therefore, not sufficiently sensitive. This can be remedied by treatment with alc. and dil. acid in a Soxhlet extractor. W. T. H.

Determination of copper (particularly with respect to sugar determinations) by means of potassium thiocyanate and potassium iodide. G. BRUHNS. *Z. anal. Chem.* 59, 337-50(1920).—Partly to save the expense during the war, an excellent method for the iodometric detn. of Cu has been devised in which KI is replaced for the most part by KCNS or NH_4CNS and yet in the final titration the same quantity of $\text{Na}_2\text{S}_2\text{O}_3$ is used. According to the old method 2 moles of Cu^{++} react with 4 moles of KI and liberate I_2 to react with 2 moles of $\text{Na}_2\text{S}_2\text{O}_3$, but the Cu is all precipitated as Cu_2I_2 and an excess of KI is necessary to keep the liberated I_2 in soln. as I_3^- . In the new method one or the other of the following reactions take place, both of which lead to the same results: $2\text{Cu}^{++} + 4\text{I}^- \rightarrow \text{Cu}_2\text{I}_2 + \text{I}_2$ and $\text{Cu}_2\text{I}_2 + 2\text{CNS}^- \rightarrow \text{Cu}_2(\text{CNS})_2 + 2\text{I}^-$ or $2\text{Cu}^{++} + 2\text{CNS}^- + 2\text{S}_2\text{O}_3^{2-} \rightarrow \text{Cu}_2(\text{CNS})_2 + \text{S}_2\text{O}_4^{2-}$. Again 50 cc. of Pfehling soln. was generally used for all reduction expts., but it has been found that 20 cc. is sufficient and only 100 mg. KI are required if 0.65 g. of KCNS or 0.5 g. of NH_4CNS is present. In the analysis of sugars, B. recommends the following working directions: Mix 20 cc. of sugar soln. with 10 cc. of Cu soln. (69.28 g. of sulfate crystals per liter or an equivalent amt. of nitrate or chloride), 10 cc. of alk. Rochelle salt soln. (346 g. Rochelle salt and 100 g. NaOH per liter) in a 200 cc. Erlenmeyer and boil exactly 2 min. over a small flame. Immediately add 50 cc. of water that is at room temp., place a small beaker over the mouth of the flask and cool the contents by running water. When at room temp. add 5 cc. of iodide-thiocyanate soln. (contg. 13 g. KCNS and 2 g. KI per 100 cc.), shake well, introduce 10 cc. of 6 N HCl or 6.5 N H_2SO_4 and titrate promptly with $\text{Na}_2\text{S}_2\text{O}_3$ soln. (34.4 g. of the salt and about 0.1 g. NaOH per liter). Titrate rapidly until the brownish coloration begins to appear gray. Add sufficient starch soln. and titrate slowly until a leather-yellow (or red with considerable Cu_2O) precipitate is seen and the blue iodide of starch color does not return in 5 min. If there is a large sepn. of Cu_2O , add starch at the beginning of the titration and, to accelerate the liberation of I , do not cool below 30°. Tables are given for the computation of the results. W. T. H.

The precipitation of tin by iron. N. BOUMAN. Amsterdam. *Rec. trav. chim.* 39, 537-41(1920).—Kolthoff (*Chem. Weekblad* Dec. 1919) states that metallic Fe cannot be used to ppt. Sn from solns. of SnCl_4 contrary to a statement made by Ada Prins in her qual. analysis. B. has tested this statement. He found that with the method used by Smits and Lohry de Bruyn for detg. the equil. potential of Ni that by the addition of a soln. of SnCl_4 the potential of Fe becomes less negative by 100 millivolts and thus less negative than Sn so that it can no longer ppt. Sn from solns. of SnCl_4 . The equils. involved are discussed at some length. When *ferrum reductum* is used Sn is ppt'd. Accordingly both statements are correct under suitable conditions. E. J. W.

Criticism of the use of phenolphthalein and of diphenylamine in the persulfate method for the determination of manganese. D. H. WESTER. The Hague. *Rec. trav. chim.* 39, 600-2(1920).—W. has discussed the persulfate method for the detn. of Mn previously (*C. A.* 14, 2595). The expts. described here show that the use of an alk. soln. of phenolphthalein as a comparison liquid in the colorimetric

detn. of Mn by the persulfate method as suggested by Tillmans and Mildner (*C. A.* 8, 3085) ought to be rejected. E. J. WITZEMANN

The use of electrometric titration methods. C. O. BANNISTER. *Electrician* 85, 535-7(1920).—Details are given concerning the app. and method of detg. Cr, V and Mn, in special steels by electrometric titration. W. H. BOYNTON

The analysis of basic slags from the Martin process. OTOKAR QUADRAT. *Chem. Listy* 14, 10-3(1920).—Details are given for the detn. of total Fe, FeO, Fe₂O₃, total S and S²⁻ in basic slags. Numerous analyses are given and sources of error are pointed out. JOHN W. KRUO.

Precipitation of the calcium group and of magnesium. I. I. M. KOLTHOFF. Utrecht. *Pharm. Weekblad* 57, 1229-34(1920).—Using Na₂CO₃, the pptn. of Ca, Sr or Ba is sensitive to: Ca 1, Sr 2 or Ba 4 mg. per l. With (NH₄)₂CO₃ the pptns. are sensitive, even on adding NH₄OH and boiling, to only: Ca 5, Sr 5 or Ba 10 mg. per l. Pptn. with (NH₄)₂CO₃ alone is sensitive to: Ca (cold) 25, Sr (boiling) 10 or Ba (boiling) 20 mg. per l. Presence of NH₄ salts decreases the sensitivity. The use of Na₂CO₃ is therefore recommended. Partial pptn. of Mg along with Ca, Sr or Ba is best avoided by adding NaOH, which ppts. all the Mg in form suitable for the chromate sepn., after which the Mg may be reptd. as MgNH₄PO₄. JULIAN F. SMITH

Limestone resources of Pennsylvania. Supplementary report. F. J. HALBEN and WM. FEAR. Pennsylvania Agr. Expt. Sta., *Ann. Rept.* 1915-16, 423-4.—The calcium content of limestone was detd. by dissolving the sample in a definite vol. of HNO₃ soln. and subsequently titrating the excess of acid in the 0.05 N NaOH using phenolphthalein as indicator. J. J. SKINNER

Fluorine and fluorides. G. DENIGES. *Rev. chim. pura applicada* 4, 163-74(1919).—The phys. properties of F and fluorides are described, and detailed descriptions are given of several more or less well known methods for the quant. detn. of F in various materials. M. R. SCHMIDT

A new microchemical two-phase reaction for the detection of magnesium ammonium phosphate. HERMANN KUNZ-KRAUSE. *Ber.* 53, 1672-3(1920).—The procedure described is particularly applicable for testing urine sediments, although it may also be applied to certain botanical and pharmaceutical tests. A soln. of the sediment in AcOH is just neutralized with NH₄OH and AgNO₃ is added, giving a curdy ppt. of Ag₃PO₄. The further addition of a drop of NH₄OH causes the ppt. to be replaced by glistening prismatic crystals of the original MgNH₄PO₄. When testing for H₃PO₄ in general and especially for phosphates in urine, the material must first be treated with MgSO₄ or MgCl₂. Flat-bottomed watch glasses or thin-walled crystallizing dishes are best suited for carrying out the reaction microchemically. S. G. SIMPSON

Volatilization losses of phosphorus during evaporation of phosphates with sulfuric acid or fusion with pyrosulfate. W. F. HILLESTRAND and G. E. F. LUNDELL. *J. Am. Chem. Soc.* 42, 2609-15(1920).—The possibility of losing P₂O₅ during evapn. with H₂SO₄ or fusion with K₂S₂O₈ is of importance in the analysis of rocks, slags and many other materials. The expts. here described show that there is no loss of P₂O₅ below 150°, or if the evapn. is stopped when fumes of H₂SO₄ appear. Fusion with K₂S₂O₈ in covered crucibles at a dull red heat causes appreciable losses with primary and secondary phosphates and possibly with tertiary phosphates. In detg. PO₄³⁻ it is important to remember that H₄P₂O₇ and HPO₄²⁻ are formed by evapn. with H₂SO₄ to dryness or by fusion with K₂S₂O₈ and it is a tedious operation to convert all of these acids back to H₃PO₄ so that a ppt. of MgNH₄PO₄ can be obtained. W. T. H.

Colorimetric determination of ammonia, nitrite and nitrate. I. M. KOLTHOFF. Utrecht. *Pharm. Weekblad* 57, 1253-64(1920).—Studies were made of the influence of time, temp., amt. of reagent and presence of impurities on the accuracy of colorimetric detns. In using Nessler's reagent the max. color intensity occurs after about 15 min.

It is best to use 0.5 cc. of reagent to 50 cc. of sample. A little excess KI greatly lessens the sensitivity; Br^- and CNS^- have a less marked effect and Cl^- has hardly any. SO_4^{2-} hastens coagulation of the colored substance; HPO_4^{2-} lessens the color intensity; CN^- inhibits the color formation. For use in slightly colored samples a reagent (sensitive to 0.1 mg. NH_3 per l.) for nephelometric detns. is made by dissolving 2.5 g. NaCl , 2.5 g. HgCl_2 , 8 g. NaHCO_3 and 1.2 g. Na_2CO_3 in 100 cc. H_2O , allowing to settle and decanting the clear liquid. The optimum concn. is 0.2-0.3 cc. of reagent to 50 cc. of sample. For nitrates the method of Frederick (C. A. 13, 3259) gives good results when modified to the following procedure: Evap. the sample with 0.5 cc. N NaCl , add 2 cc. of F.'s phenolsulfonic acid reagent, heat 20 min. on a water bath, and finally dil. and make alk. with NH_4OH as prescribed by F. Under these conditions the color intensity is proportional to the NO_2^- content. NO_2^- gives only 8-9% of the color intensity caused by NO_3^- , and so in most cases may be neglected. Attempts under many conditions to det. NO_2^- with brucinesulfonic acid were unsuccessful. The color requires about 12 hrs. to reach max. intensity and is not proportional to the NO_2^- content. For nitrites, the Griess-Romijn reagent is very easily affected by time, temp., concn., etc. The test is best carried out as follows: To 50 or 100 cc. of sample add 100 cc. of reagent, heat for 5 min. at 55-60°, cool and read the color. In case of hard waters a little HOAc should be added. H_2SO_4 interferes. Alkalinity interferes by decreasing the H^+ concn.; as low a concn. of HCO_3^- as 0.0025 N noticeably lessens the color intensity.

JULIAN F. SMITH

The determination of formic acid in the presence of acetic by means of a refractometer. JAMORIE BUL. *Chem. Listy* 14, 6-7, 45-6 (1920).—An immersion refractometer was used. An aq. soln. of the two acids was titrated with 0.5 N NaOH using phenolphthalein as an indicator and the result expressed as g. of acetic acid per 100 cc. The corresponding refractometer reading was then obtained from Wagner's tables, and the true reading detd. on the mixt. The presence of formic acid was indicated when the latter reading was lower than the one obtained from the tables. The difference in the two readings multiplied by 0.974, a factor detd. experimentally, gave the g. of formic acid in 100 cc. of the mixt. The max. error in the method was shown to be ± 0.1 g. per 100 cc. This method can be used advantageously for detg. formic acid in ordinary vinegars and vinegar essences whose exts. are not greater than 0.1 g. in 100 cc. It is not applicable to the detn. of very small amts. of formic acids (under 0.2 g. per 100 cc.), nor for the examn. of vinegars containing acids other than acetic or formic. This excludes those made from wine or fruits.

JOHN M. KRUO

The application of a new physico-chemical titration method. RENÉ DUBRISAY. *Compt. rend.* 171, 670-2 (1920).—The principles of the previously reported methods of physico-chemical analysis (cf. C. A. 12, 1355; 13, 302, 689) are applied to the study of the neutralization of HCl and H_2SO_4 with NaOH . To 10 cc. of N acid are added in variable amts. N NaOH , the solns. dild. to 200 cc. and definite vols. of these solns. mixed with an equal vol. of phenol and the temps. of miscibility noted. The results represented graphically, using as coördinates the temp. of miscibility and the amt. of NaOH added, give a curve for HCl which shows a sharp break at the point of complete neutralization, when the temp. of miscibility with PhOH reached a max. The curve for H_2SO_4 shows two breaks, one for the addition of 1 mol. of NaOH and the other for complete neutralization. The temps. of miscibility with PhOH of mixts. of equimolecular solns. of Na_2SO_4 with H_2SO_4 and of Na_2SO_4 with HCl are detd. and compared with the calcd. values. The greatest divergence from the calcd. values occurs when equal vols. of the solns. are used. In the first case this corresponds with the amts. necessary for the formation of NaHSO_4 and in the second case it indicates a reaction between HCl and Na_2SO_4 and the establishment of an equil. between the acids and their salts.

G. W. STRATTON

The determination of the hydrogen number of indicators (MICHAELIS, GYERMANT) 2. Sources of error in the Kjeldahl method of nitrogen determination (KARN) 29. Action of very concentrated solutions of iodic acid on ammonia gas (DENIGRS, BARLOT) 6.

Titration by weight. W. P. HEATH. U. S. 1,358,950, Nov. 16. Titration is performed on a scale pan and the amt. of titer added is indicated by weighing.

8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND WILLIAM F. HUNT

Recent accessions to the mineral collection of the U. S. National Museum. W. F. FOSHAG. *Proc. U. S. Nat. Museum* 58, 303-5(1920).—These comprise remarkably fine specimens of cinnabar and arsenoite from Hunan Province, China, scheelite from Korea, danburite from Obira, Japan, wiluite (a variety of vesuvianite) and achataragite from eastern Siberia, inyoite from Nova Scotia, and several Zn minerals from Franklin Furnace. Specimens of zincite from the last were in some cases coated with galcite.

L. W. RIGGS

Sulfur spherules produced in crater lake of the volcano Shirane (Kozuke), Japan. R. OHASHI. *J. Akita Mining Coll., Japan*, (Jan. 1919).—Three different forms are found: (1) Hollow spherules, (2) solid grains; and (3) tubes; varying in diam. from 3 to 6 mm. and in length from 3 to 10 mm., rarely 20 mm. The varying appearance of these spherules is discussed with illustrations. These spherules are minute pieces of S detached in molten state from the hot molten mass and by gas action of bubbles, which the S completely envelops, and are thus thrown up to the surface of the water. Perforation is due to escape of gases confined in the S shell.

N. V. P.

Mineral statistics. ANON. *Mineral Ind.* 28, 802-83(1919).—Tables of production and trade for the principal countries of the world.

A. B.

Precious stones. GEORGE F. KUNZ. *Mineral Ind.* 28, 584-613(1919).—A review of the world's production and trade, including diamonds, pearls, opal, sapphire, etc.

A. B.

The origin of petroleum oils. E. CORTESE. *Rass. min. met. chim.* 53, 1-4 (1920).—Theories which attribute petroleum deposits to decomposition and distillation of organic residues, vegetable or animal, are not sufficient to explain all the variations observed. C. considers that a purely inorganic origin is possible in some cases, particularly as regards asphaltic or bituminous deposits. Hydrocarbons may have originated by chemical action, such as $\text{CaCO}_3 + \text{H}_2\text{S} + \text{H}_2\text{O} = \text{CaSO}_4 + \text{CH}_4$.

J. S. LAIRD

Chemistry of the earth's crust. HENRY S. WASHINGTON. Geophysical Lab. *J. Franklin Inst.* 190, 757-815(1920).—The number of essential rock-forming minerals is very small, and includes chiefly silicates of Al, Fe, Mg, Ca, Na, and K. The av. igneous rock is approx. granodiorite. The 12 elements, O, Si, Al, Fe, Ca, Na, K, Mg, Ti, H, P, and Mn form 99.61% of the earth's crust. The chem. elements fall into 2 groups, petrogenic and metallogenetic. The petrogenic elements are characteristic of and most abundant in the igneous rocks, have a low at. wt., and normally occur as oxides, silicates, chlorides, and fluorides. The metallogenetic elements are rare or absent in the igneous rocks, have a high at. wt., occur as ores (native metals, sulfides, arsenides, bromides, etc., but not primarily oxides or silicates). It is suggested that beneath the silicate crust of petrogenic elements occurs first a zone essentially of Ni and Fe, then a central core of metallogenetic elements. In igneous rocks and minerals, the elements show a correlation in that certain of them are prone to occur with others. Igneous rocks are distributed in conmagmatic regions, i. e., regions of chem. related

magmas. Calcn. is made of the rock ds. from their chem. compn., also of the av. chem. compn. and ds. of the continental masses and oceanic floors. The results show that the av. ds. of the continents, ocean floors, and various smaller regions of the earth stand in inverse relation to their elevations; these facts are confirmative of the theory of isostasy. Attention is paid to the general characters of igneous rocks, the presence of gases and water vapor in the magma, and the analogy of the latter with a salt soln.

JOSEPH S. HEPBURN

Comparison of salt lands in the Deccan and in Sind. V. A. TAMHANE. *Agr. J. India* 15, 410-17 (1920).—Inundation, flood and extremes of weather cause upward and downward movement of water in the upper few feet of soils, which is responsible for the formation and deposition of salts in the alluvial tract of Sind. Origin of salt lands in the Deccan is to be found in the general rise of sub-soil water table which is caused by introduction of perennial canals; evapn. leaves the salts behind. The alkali salts in Sind are decompr. products of the alluvium itself while the Deccan alkali salts are mostly formed by the disintegration and decompr. of trap rock. Chem. analyses of trap rock and of river water used in irrigation in the Deccan are given. Na salts make up 50-85% of the salt content of the trap rock while a large % of the solids in the river water consists of K and Na salts. A comparison of the salt land shows that in the Deccan a large proportion of the salt is Na_2SO_4 whereas, in Sind, NaCl predominates over the other salts.

F. M. SCHERTZ

Investigation of terrestrial gases. F. HENRICH. *Ber.* 53B, 1940-9 (1920); cf. *C. A.* 3, 1136; 5, 1385.—The methods of collecting and analyzing gas from a cold spring near Leupoldsdorf are given. The compn. of the gas was in vol. %: CO_2 0.0, N: 86.0, O₂ 13.0, A 1.0. As the gas is clearly air, somewhat deoxygenated, the conclusions previously reached from the study of gas from the Wiesbaden thermal spring are confirmed.

A. R. MIDDLETON

9—METALLURGY AND METALLOGRAPHY

WILLIAM BRADY, ROBERT S. WILLIAMS

Gold, silver, copper, lead and zinc in the eastern states in 1919. Mines report. J. P. DUNLOP. U. S. Geol. Survey, *Mineral Resources of the U. S.* 1919, Pt. I, 41-50 (preprint No. 8, publ. Nov. 8, 1920). E. J. C.

Two centuries of Pennsylvania iron smelting. RICHARD PETERS, JR. *Raw Material* 3, 190-8 (1920); illustd. E. J. C.

The blast-furnace hearth. WALTHER MATHESIUS. *Chem. Met. Eng.* 23, 867-72 (1920).—A wide hearth permits steeper bosh and flatter stack lines with many resulting economies, especially for smelting Mesaba ores. Operating data, construction details and theoretical considerations point to its definite superiority. V. O. HOMERBERG

High-manganese iron in basic open-hearth practice. E. A. WHEATON. *Iron Age* 106, 1112-4 (1920).—Tests made at the Bethlehem Steel Co. by sampling metal in ladle at blast furnace and at open-hearth mixer show that it is possible with high Mn-Fe to run lean slags, to maintain tonnage, and with S in the blast furnace as high as 0.10%, to deliver the Fe to the open-hearth furnace through the mixer with 50% of the S eliminated. In the opinion of the author, none of the objections, such as decreased tonnage, decreased yield, scorification of furnace banks or of ladle linings were met and a slightly better product was obtained. Red-shortness, due to O, can be much reduced by means of Mn. KARL L. FORD

The basic open-hearth process. F. L. TOY. *Iron Age* 106, 1116-8 (1920).—The article deals with the development and the present status of various fuels, efficiency of the different parts of the process and their uses. KARL L. FORD

American rolling-mill furnaces remodeled. ANON. *Iron Age* 106, 1318-9(1920); illustd. E. J. C.

New rolling mill for alloy steels. ANON. *Iron Age* 106, 1597-9(1920); illustd. E. J. C.

Navy armor-plate and gun-forging plant. ROGER M. FREEMAN. *Iron Age* 106, 1458-62, 1600-4(1920).—An illustrated description. E. J. C.

Smelter laboratory of the United Verde Extension. H. O. HAMMOND. *Eng. Mining J.* 110, 991-3(1920).—An illustrated description. E. J. C.

Foundry equipment in modern plants. JOSEPH J. WILSON. *Iron Age* 106, 1302-7(1920); illustd. E. J. C.

Brass foundry practice. H. B. WEEKS. *J. Inst. Metals* 1920, adv. copy, 14 pp.—A review of the growth of the brass-founding industry in Barrow, covering the period from about 1871 to date. During this period of about fifty years, the brass foundry grew from a plant having a capacity of 5 tons per week to such a capacity that during the 5 yrs. covering the war period they produced 16,868 tons of castings ranging from 23 tons 10 cwt. to 1 oz. in size, with the total av. rejections for the 5 yrs. of 3%. Methods of operation, equipment, organization, plant lay-out, etc., are discussed. O. E. H.

Ten years of the metal-spraying process. M. U. SCHOOP. *Chem. Ztg.* 44, 813-4(1920).—A retrospect. E. J. C.

Some deep-etching experiments on new steel rails. GEO. F. COMSTOCK. *Chem. Met. Eng.* 23, 1081-2(1920).—The samples chosen were all hot-sawed sections of A-rails, half of them being rails made according to usual practice and more or less segregated, and half being Ti-treated rails having a uniform structure. Lengthwise sections 4 or 5 in. long were cut parallel to the base of the rail, and a little below the center of the head, and these were boiled for several hrs. in strong HCl, until their macrostructures were prominently developed. The homogeneous rails showed sections free from any pits or markings except the lines due to the rolling out of the original dendritic structure of the ingots. The ordinary segregated rails showed numerous deep streaks or elongated pits that are due not to any unsound or shattered condition of the steel, but to segregation of impurities, chiefly S, which caused the metal in those streaks to dissolve faster.

V. O. HOMERBERG

Revealing macrostructure of iron and steel. HENRY S. RAWDON. *Iron Age* 106, 965-8(1920).—R. points out the usefulness of $(\text{NH}_4)_2\text{S}_2\text{O}_8$ as a reagent for revealing the macrostructure of Fe and steel. Its action depends primarily upon the formation of acid and the liberation of O from the spontaneous decompr. of the salt upon the addition of H_2O . It is to be recommended particularly for revealing the cryst. condition of Fe and steel although chem. inhomogeneity is also indicated. Photographs are included to contrast the results obtained with this reagent to those obtained with other reagents. The ease of application is emphasized. Also in *Bur. Standards Sci. Papers*, 1920, No. 402, 715-23.

V. O. HOMERBERG

Metallurgy of arc-fused steel. HENRY S. RAWDON, EDWARD C. GROSSBECK AND LOUIS JORDAN. *Chem. Met. Eng.* 23, 777-84(1920).—Microscopic examn. of bent pieces of arc-fused metal show that the metallic grains are inherently ductile, even to a high degree. Grosser imperfections, however, are entirely sufficient to mask this mark of excellence. The view that the characteristic features observed in the structure of the arc-fused Fe are due to the increased N content is supported by several different lines of evidence. These include the likeness of the structure of the material to that of pure Fe which has been "nitrogenized," the similarity in the behavior of both arc-fused and nitrogenized Fe upon heating, the evidence shown by thermal analysis of the arc-fused metal, together with the fact that, as shown by chemical analysis, the N content increases during fusion, while the other elements, aside from O, decrease in amt. The characteristic form in which oxide occurs in Fe, together

with its behavior upon heating, renders the assumption that the oxide is responsible for the plates observed in the material a very improbable one. Two types of electrodes, a "pure" Fe called "A" and a mild steel called "B," were used in the investigation. They were used in the bare condition, and also after receiving a slight coating. Judged from the results obtained, neither type of electrode appears to have a marked advantage over the other. The use of a slight protective coating on the electrodes does not appear to affect the mechanical properties of the arc-fused metal materially in any way. The specimens were prepd. in a manner quite different from that used ordinarily in electric-arc welding and the results do not justify any specific recommendations concerning methods of practice in welding.

V. O. HOMERBERG

Studies of the constitution of steel. EDWARD D. CAMPBELL. *Proc. Nat. Acad. Sci.* 5, 428-7 (1919).—A brief discussion is given on the soln. theory of steel and the influence of changes in carbide concn. on the elec. resistivity. V. O. HOMERBERG

Segregation in bars for steel tubing. HAROLD D. NEWELL. *Chem. Met. Eng.* 23, 745-6 (1920).—Expts. for segregation were conducted in acid and basic steel ingots for boiler-tube steel with and without the additions of Al in the ladle. In ingots to which no Al had been added, excessive segregation usually occurred down the central port anywhere from 6 in. from the top to half-way down the entire ingot, S tending to segregate the most, then P, C, and finally Mn. The effect of the addition of Al in the ladles as an oxidizing agent was to tend to reduce immediately the amt. and depth of segregation. Steel tapped from the open hearth and containing Fe oxide, upon cooling, causes an evolution of CO due to the reduction of the oxide by C. Blowholes are thus produced. The addition of small amts. of Al to such metal greatly facilitates the flow of metal from the ladle and also stops the violent evolution of gases, allowing the production of sound ingots without excessive blowholes. Two to 5 ounces of Al per ton of metal are usually sufficient.

V. O. HOMERBERG

Intercrystalline fracture in mild steel. WALTER ROSENHAIN AND D. HANSON. *Iron and Steel Inst.* Sept. 1920, advance copy, 8 pp.—Ample confirmation has been found of the general observation that, except at very high temps., the fracture of mild steel occurs mainly by the breaking across of ferrite crystals and not by the sepn. of one crystal from another. This fact was verified by the systematic examn. of fractures, in many cases by the aid of transverse sections cut after the original fractured surface had been embedded in a layer of electro deposited Cu. In a small number of exceptional cases, however, distinct evidence of intercrystalline fracture was obtained. In these cases it was clear from microscopic exam. that failure had occurred mainly by the sepn. of crystals from one another and not by the rupture of the crystals themselves. Four cases are discussed involving boiler plates and mild steel tubing. The character of the cracks showed a marked resemblance to "season cracking" in ordinary brass. In all the cases the article in question had been exposed for a considerable period to a slightly elevated temp. Up to the present time the authors had not observed a fracture of this kind in a steel article that had been exposed to stress at the ordinary temp. only. The formation and the development of the intercrystalline cracks may have been accelerated by corrosive action.

V. O. HOMERBERG

Temper brittleness of nickel-chromium steels. R. H. GREAVES AND J. J. A. JONES. *Trans. Iron & Steel Inst. (London)* Sept. 1920, preprint, 48 pp.—The investigation was carried out on some Ni-Cr and other steels with a view to det. the range in which temper brittleness is produced, the rate at which it is produced, the susceptibility of certain steels to develop temper brittleness, and the effect of the change from the brittle to the tough condition on a few of the physical properties of the steel. The results of the investigation are described in detail and supplemented by a great many plots and tables.

V. O. HOMERBERG

A review of the development of copper steel. D. M. BUCK. *Iron Age* 106, 1109-10 (1920); cf. *C. A.* 14, 1289.—The best results based on present knowledge of the situation, considering av. materials of construction are obtained by alloying with normal open-hearth or Bessemer steel, from 0.15 to 0.30% pure Cu. The official test of Committee A-5 on Corrosion, Am. Soc. Testing Materials, exposed bare unprotected corrugated sheets of 16 and 22 gage to atm. conditions corresponding to Atlantic coast, inland industrial, and inland rural section. Analysis of author's results and data of above test indicate that 300-500% increase in life of unprotected metal is obtained by the addition of Cu, also better adherence of paint coating to Cu-steel.

KARL L. FORD

Rates of solution of iron and steel in non-oxidizing and oxidizing acids. WILLIAM D. RICHARDSON. *American Inst. Chem. Eng.* 1920.—Relatively pure Fe dissolves at a low rate in non-oxidizing acids such as normal H_2SO_4 (and HCl), whereas less pure metals, such as cast Fe, white cast Fe and malleable Fe, dissolve at a relatively high rate, while cast steel dissolves at a rate between the two. On the other hand, in normal HNO_3 , the relatively pure metals dissolve at a very high rate while the less pure metals, such as cast Fe, white cast Fe, malleable Fe, and semi-steel, dissolve at a much lower rate, and cast steel again occupies a position between the 2 extremes. Although the difficulties of reproducing exactly identical conditions are great, the results reported appear to be sufficiently comparable to indicate the general rule. Just what impurities in the less pure metals cause the different behavior in non-oxidizing and oxidizing acids has not been definitely proven but undoubtedly C plays an important part.

V. O. HOMERBERG

The solubility of metals in acids containing formaldehyde. R. C. GRIFFIN. *J. Ind. Eng. Chem.* 12, 1159-60 (1920).—Exptl. results are tabulated which show the inhibitory effect upon the soln. of metals by mineral acids caused by the presence of HCHO. This effect is marked in the case of ferrous metals. A practical application is the use of HCl containing 1% HCHO, which secures pickling of rusty steel without appreciable effect upon the steel itself.

W. H. BOYNTON

New magnetic testing apparatus. ANON. *Iron Age* 106, 1125-8 (1920).—A detailed description of the *defectoscope*, together with its applications, is given. Photographs are included to show its application for the testing of rails. KARL L. FORD

Analysis does not tell the story. HENRY TRAPHAGEN. *Foundry* 48, 880-1 (1920).—T. points out the fallacy that low S and low P indicate good metal while high amounts indicate poor metal. The content of slag, coal ashes, oxides of Fe, and alumina is not taken into account. Inspection of methods is urged.

V. O. HOMERBERG

The heat treatment of automobile steels. R. R. ABBOTT. *Iron Age* 106, 1110-2 (1920).—A. points out that no alloy steel has any distinct advantage for automobile construction, but the heat treatment greatly influences the fitness of the steel for different uses. Heat treatment based on the special use for the steel offers more promising results than the development of new alloys, and will greatly increase the life and wear of the metal.

KARL L. FORD

Heat treatment improves castings. FRED GROTS. *Foundry* 48, 859-60 (1920).—The strength and elongation of cast-steel tractor parts are improved by a quench-and-draw treatment. The dangers from hardening cracks are eliminated by removing castings from water before entirely cool.

V. O. HOMERBERG

Modern casehardening building at Providence. ANON. *Iron Age* 106, 1539-40 (1920); illustd.

R. J. C.

Self-annealing in aluminium bronze. AUSTIN B. WILSON. *Foundry* 48, 776-8 (1920).—Large castings acquire a coarse structure when allowed to cool slowly due to a phenomenon known as self-annealing. Modification of compn., pouring cold and spraying with H_2O prevent this. Heat treatment strengthens the metal.

V. O. H.

Foundry methods for light aluminium-copper alloys. ROBERT J. ANNENSON. *Chem. Met. Eng.* 23, 735-7(1920); cf. *C. A.* 14, 1655.—It appears, taking everything into consideration, that light Al-Cu casting alloys for casting purposes may be most conveniently made by using the 50:50 alloy. Under the conditions of fast practice which obtain in large foundries this alloy appears to be safer. There is less calculating to be done than in the case of 33:67 alloy; it melts at a lower temp. than Al; it is brittle and therefore can be weighed out with great accuracy; and, considering all factors, it is more fool-proof. The use of Cu may be more economical in some cases. So far as quality of castings is concerned the various methods are doubtless equally good, provided thorough alloying is obtained.

V. O. HOMERBERG

Manufacture of rich copper-aluminium alloys or hardeners. ROBERT J. ANNENSON. *Chem. Met. Eng.* 23, 617-21(1920).—Cu for hardening Al alloys is usually introduced by adding a rich Cu-Al alloy, either 33 Cu:67 Al or 50 Cu:50 Al. The rich alloys are made by adding solid Al to molten Cu, solid Cu to molten Al, or pouring molten Cu into molten Al. The last is the best method, giving better mixing and less loss from dross. Heat is developed by the addition, due to the thermite reaction, and the temperature should be kept down by adding part of the Al in solid pieces. The method of pouring molten Al into Cu is unsatisfactory.

A. BUTTS

Copper and brass. J. F. SPRINGER. *Brass World* 16, 357-60(1920).—A consideration of the light-colored metals from early times to the present.

C. G. F.

Corrosion of brass in dilute electrolytes. J. H. REEDY AND BERTRAM FRUER. *J. Ind. Eng. Chem.* 12, 541-7(1920).—High concn. of electrolytes favors electrolytic corrosion in an additive way, and retards, or even inhibits, complete corrosion. Elevated temps. favor electrolytic corrosion, but diminish complete corrosion by diminution of dissolved O. Contact with metals nobler than brass favors electrolytic corrosion, and is without influence on complete corrosion. Dissolved O has no appreciable effect on electrolytic corrosion, but is essential to complete corrosion. The presence of ions or groups that combine with Zn and Cu ions to form compds. of low ionization favors both electrolytic and complete corrosion. There is no specific influence of ions in electrolytic corrosion except in the case of ions that form complexes of low ionization and in the case of H ion; on the other hand, there is marked specificity in complete corrosion, believed to be largely detd. by O only. Homogeneity reduces electrolytic corrosion, and has no effect on complete corrosion.

V. O. HOMERBERG

Polishing and etching of zinc for microexamination. H. H. HAYES. *J. Inst. Metals* March 12, 1920.—Polish on standard French emery papers, finally using the 0000 paper. Rub on chamois leather smeared with "Globe Polish," and finally with the tip of the finger in the usual way. Clean with ether (free from H₂O), and dry in hot-air blast or on linen. Since water must be kept away from the specimen, the use of Al₂O₃ or MgO with H₂O on parchment or chamois leather is impossible. HNO₃ (d. 1.5) is used as the etching reagent. The microsection is held in Zn-tipped forceps, immersed in the acid for 1 sec., and immediately rinsed in H₂O and dried by a hot-air blast.

V. O. HOMERBERG

Modern methods of galvanizing. ANON. *Das Metal.* 1920, 243-6.—A review.

C. G. F.

Notice concerning metal tubes which are stable towards water vapor at over 1000°. PAUL ASKENASY. Karlsruhe. *Z. Elektrochem.* 26, 436(1920).—Both Cr-Ni tubes and tubes made from "silicized" sheet Fe have been found to withstand attack by H₂O vapor at temps. above 1000°.

H. JERMAIN CREIGHTON

Recent developments in electropercussive welding. D. F. MNER. *Elec. Rev.* 77, 679-82(1920).—Details of electrostatic and electromagnetic equipments and processes. A number of practical applications are cited. In wire welders the energy is taken from an electrolytic condenser. Sets of Al plates immersed in an electrolyte

of borax soln., are charged by d. c. and discharged at the moment of welding. This discharge takes place at the point of contact of the parts to be joined and melts them with an explosive violence. At this moment the hammer forges them together into a perfect union. The entire operation takes 0.005 sec. Micrographs show welds between Cu and steel. Passing from steel to Cu there is an increase in pearlite concn.; after this comes a laminated mass of pasty and melted steel which mingles with a layer of fused Cu; back of this is the unchanged coarse grain of the Cu. Little or no alloying takes place and the 2 metals are sharply defined but interwoven by the force of compression. Interpenetrations are visible; there are small globules of steel in the area of fused Cu. C. G. F.

Practical applications of electric welding. F. P. VAUGHAN. *J. Eng. Inst. Canada* 3, 556-64 (1920).—A review profusely illustd. C. G. F.

Electric arc welding. J. H. ANDERTON, F. A. ANDERSON AND R. E. FRICKEY. *J. Electricity* 45, 508-15 (1920).—Three papers of general import. C. G. F.

Electric welding. F. H. WILLIAMS. *J. Eng. Inst. Canada* 3, 514-21 (1920).—History and survey of elec. welding methods concluding with a brief illustd. account of research work. Ten photomicrographs are shown of boiler plate and Fe tube welds; 2 of cast iron welds. C. G. F.

Electric arc welding. CH. ANORY-BOURGEOIS. *Électricien (Paris)* 36, 441, 462 (1920).—A review. C. G. F.

The analysis of basic slags from the Martin process (QUADRAT) 7.

Concentrating ores. R. H. RICHARDS. U. S. 1,350,105, Nov. 16. The pat. relates to mechanical sepn. of slimes and granular material.

Apparatus and mode of operation for concentrating ores. F. G. GASCHE. U. S. 1,359,496-7, Nov. 23.

Calcining ores. W. H. CORBOULD. U. S. 1,358,298, Nov. 9. Finely pulverized Cu ore with accompanying gang is heated in a roasting furnace while alternately subjected to the action of air under pressure and to a vacuum, to effect rapid action on the ore. Cl may be supplied with the air.

Extracting platinum and other metals from ores. S. S. SADTLER. U. S. 1,358,248, Nov. 9. In the extrn. of Pt and other precious metals from their ores, the ore is mixed with a soln. of NaOH to form a pulp and the pulp is agitated and electrolyzed in contact with a Hg cathode.

Recovering copper from ores. N. C. CHRISTENSEN. U. S. 1,357,952, Nov. 9. Cu is obtained by recovery in a SO_3 soln. and pptn. from the latter as a cupro-cupric sulfite by mixing metallic Cu with the soln.

Recovering metals from natural waters. O. NAGEL. U. S. 1,358,096, Nov. 9. Metals such as Au, Ag or Ra are recovered from natural waters, e. g., saline waters, by removing suspended matters from the water and then passing it through an absorbent such as sawdust, granulated blast furnace slag coated with Fe_2O_3 , $\text{Al}(\text{OH})_3$, infusorial earth, coal, coke or peat.

Vanadium from vanadiferous iron ores. W. M. GOODWIN and A. F. G. CADEN-HEAD. U. S. 1,359,473, Nov. 16. A mixt. of an Fe ore containing V with alloying elements such as chromite is reduced by furnacing to a pig Fe containing V. The pig Fe is decarbonized and the V and some other alloying constituents thereby sepd. from the Fe. The slag which is rich in the V and other alloying constituents is refurnaced with fresh ore to remove the alloying materials and concentrate them in the pig Fe produced and this cycle of operations is repeated until a pig Fe is produced sufficiently rich in the alloying components, e. g., a ferro-V. Cf. *C. A.* 14, 528.

Removing copper from ordnance. A. E. A. DAGORY. U. S. 1,359,338, Nov. 16. Cu deposits in ordnance are treated with Sn and Pb or other material which unites with the Cu to form an easily melting compd. which will be fused and driven out of the gun when the latter is fired. The Sn and Pb are fired through the gun by an explosive shell.

Recovering tin from waste materials. T. A. EKLUND. U. S. 1,359,494, Nov. 23. Sn-bearing waste such as "tin putty" or "tin slime" is treated with HCl and Cl, KNO_3 or other oxidizing agent and the resulting liquor containing $SnCl_4$ is then treated with waste containing metallic Sn to reduce the $SnCl_4$ to $SnCl_2$. The latter is electrolyzed to recover the Sn. Cf. *C. A.* 14, 1805.

Detinning tin scrap. C. E. CARRIER, JR. U. S. 1,358,136, Nov. 9. Sn scrap to be detinned is treated in sep. portions and successive stages, first, with dil. anhydrous Cl, until the major portion of the Sn is removed (using Cl so dild. that reaction with the Fe does not take place), and then with more concd. Cl which completes the detinning.

Annealing and removing scale from tin plate. I. M. SCOTT. U. S. 1,359,282, Nov. 16. "Tin plate" to be annealed and descaled is packed in annealing boxes in finely divided C and heated to a temp. of 450-1000° to reduce scale without materially carbonizing the metal.

Removing scale from metal plates. I. M. SCOTT. U. S. 1,359,281, Nov. 16. Scale is removed from metal plates by heating them in contact with powdered ferro-Si to reduce the scale. A temp. of about 700-1000° may be employed in treating Fe plates after rolling.

Blast furnace for smelting volatile ores. W. D. KILBOURN. U. S. 1,358,858, Nov. 18. The furnace is especially adapted for smelting Zn ore to recover ZnO.

Hardening copper. B. KIEFFER. U. S. 1,359,810, Nov. 23. Cu is hardened by heating to somewhat below its m. p., applying finely divided glass to its surface and then quickly cooling.

Treating copper ores with sulfur dioxide. N. C. CHRISTENSEN. U. S. 1,358,819, Nov. 9. Cu ore is lixiviated with a SO_2 soln., the soln. thus obtained is sepd. from the ore and Cu_2O is added to it to ppt. the Cu as cupro-cupric sulfite.

Improving magnetic quality of metal. T. D. YENSEN. U. S. 1,358,810, Nov. 16. The magnetic quality of Fe and its alloys with Si or Al is improved by heating to a temp. of about 800-1100° under oxidizing conditions and then slowly cooling. A succeeding annealing in H may be advantageous with some alloys.

Uniting dissimilar metals. G. A. MEAD. U. S. 1,359,719, Nov. 23. In uniting Fe or steel with Cu or bronze the Fe or steel is coated with a metal of lower m. p. such as an alloy of Cu and Zn and the principal coating metal is then applied in fused condition.

Compacting finely divided metals. C. L. GEBAUER. U. S. 1,359,353, Nov. 18. Compact articles are formed of finely divided metals such as Fe, Ni and Cr or Fe, Mo and Cr by molding the material to the desired shape and size under great pressure and then heat-treating at a temp. above the critical temp. of all the metals in the mass but lower than the m. p. of any of them until the particles have cohered rigidly together. Tools, puppet valves and dies may be thus formed.

Cement for filling voids in brass castings. R. S. WILE. U. S. 1,359,137, Nov. 16. A mixt. for filling voids in brass castings is formed of finely divided brass, Al phosphate, H_2PO_4 , ZnO and H_2O , with or without lime or magnesia.

Crucible. A. E. BELLIS. U. S. 1,358,816, Nov. 16. A crucible adapted for heat-treating of metals is formed of an outer shell of refractory material resistant to hot oxidizing gases and a removable inner shell of non-refractory material inert to chemical salts, e. g., steel or Fe.

Furnace for heat-treating armor-piercing projectiles. F. C. LANGENBERG and J. F. FETTERLY. U. S. 1,358,755, Nov. 16.

Composition for use in case-hardening metal. J. N. BOURG. U. S. 1,358,281, Nov. 9. A mixt. for case-hardening is prep'd. by heating coke, charred leather or similar material to a temp. of about redness and while still heated spraying it with a soln. of alk. carbonates.

Casehardening and tempering. S. WHYTE. Brit. 150,035, May 21, 1919. A resist for use in casehardening, tempering, etc., contains fireclay in admixt. with alkali silicate and a flux, such as alkali carbonate or borate, made into a paste by boiling with H_2O . A small quantity of plaster of Paris may be added to hasten setting. For casehardening, the parts to be protected are first coated with an aq. suspension of powdered fireclay, whereupon two coats of the resist are applied. For tempering, the resist is applied directly to the desired parts so that during quenching the cooling effect is retarded. The alkali silicate may be prep'd. by evapg. a soln. to dryness at 300° , and then grinding.

Steel from iron ore. H. B. BRYSON. U. S. 1,358,703, Nov. 16. In making steel directly from Fe ore, scrap or the like, the Fe-bearing materials are heated in a C-lined furnace and the molten metal is maintained covered and sealed by a layer of vitreous slag, under crucible conditions.

Vanadium steel. N. C. EINWICHTER. U. S. 1,359,288, Nov. 16. Vanadium steel is slowly heated to a temp. of about 780° , quenched in H_2O at a temp. of about 15° until vibration ceases and then placed in an oil bath. This treatment serves greatly to increase the durability of rivet-setting and similar tools.

Manganese steel. W. G. NICHOLS. U. S. 1,359,268, Nov. 16. Ordinary steel scrap is charged into an elec. furnace and there is then charged into the molten metal in the furnace, in a single charge, Mn steel scrap to be incorporated and the metal is heated by slow stages until the temp. reaches the m. p. of Mn steel. Ferro-Mn is added to give the desired Mn content in the finished metal.

Steel. J. R. SPEER. Brit. 150,020, Apr. 25, 1919. A steel particularly suitable for light armor and the like contains 0.25-1.25% of Cr and 0.25-1.25% of Ni, the remainder being steel containing 0.5-1.25% of C, and the Cr being preferably not less than the Ni. An example contains 0.98% of Cr, 0.6% of Ni, 0.59% of Mn, 0.84% of C, 0.27% of Si, 0.022% of S, and 0.033% of P. Plates of the steel may be quenched from an initial temp. of 1400 - $1500^\circ F.$, then reheated 800 - $1000^\circ F.$ and allowed to cool.

Hardening high-speed steel. C. A. WHITMYRE. U. S. 1,359,851, Nov. 23. High-speed steel is hardened by heating to a temp. of about 1275 - 1300° and then quenching at about 600 - 650° .

Casehardening steel. J. D. CUTTER. U. S. 1,358,831, Nov. 16. A steel for casehardening is made with a low C content (preferably about 0.10-0.20%) and also containing Ni 0.40-0.60%, Cr 0.45-0.65% and Mo 0.25-0.35%. Si may be present up to 0.25% together with Mn 0.30-0.50%, S 0.06% or less and P 0.06% or less.

Alloys. A. DE LAVANDEYRA. Brit. 149,638, July 29, 1920. Al alloys contain small amts. of Mg, Cu and Cr, with or without Mn. The alloys are preferably made by first prep'g. rich Al alloys such as a 25% Mn alloy, a 10% Cu alloy and a 20% Mg alloy and melting these with the required amts. of Al and Cu. As or an As compd. may be used as a refining agent. The final alloys may contain 2-5% of Cu, less than 1% of Mg, and about 1% of Cr and Mn together. The alloys are preferably worked and then heated to 480 - 560° .

Alloys of alkaline earth metals. G. J. KROLL. U. S. 1,359,813, Nov. 23. A heated mixt. or alloy of an alk. metal and another metal, e. g., an alloy of Na with Pb, is treated with a molten mixt. of $CaCl_2$ and CaF_2 or $BaCl_2$ and BaF_2 in order to form

an alloy of Pb with Ca or Ba. Al-Mg alloy is formed from Al, Na, cryolite and $MgCl_2$ or MgF_2 . Be and Cu may be similarly alloyed.

Zinc alloy. H. GOLDSCHMIDT and K. MÜLLER. U. S. 1,358,147, Nov. 9. An alloy which yields sound castings is formed of Zn combined with Al 0.5-6.0%, and Mn 0.25-2.0%.

Antifriction alloy. L. M. PARKHURST. U. S. 1,359,194, Nov. 16. An anti-friction alloy suitable for bearings exposed to high pressures is formed of Pb 79, Sb 12, Sn 6, Cu 2.5 and P 0.5 parts.

Alloy adapted for use in combining with other metals. J. E. HOLDER. U. S. 1,359,064, Nov. 16. An alloy suitable for reduction or melting of other metals is formed of Pb 30-50, Cu 47-68, Ni 1-5, As $1\frac{1}{2}$ - $1\frac{1}{2}$, Mn $2\frac{1}{2}$, P $\frac{1}{2}$, and Fe $1\frac{1}{2}$ %.

Alloy for cable casings. D. STENQUIST. U. S. 1,360,045, Nov. 23. See Brit. 136,143 (C. A. 14, 1108).

Lead-silver alloy for electrical contact points. J. A. WILLIAMS. U. S. 1,358,908, Nov. 16. An alloy of Ag with about 0.5% of Pb is adapted for use in elec. contact points.

Sheets of iron-silicon alloy. W. J. BECK and J. A. AUPPERLE. U. S. 1,358,408, Nov. 9. Annealed sheets of Fe alloyed with Si are pickled with 5% H_2SO_4 , to leave a coating of siliceous compds. on them and then cold-rolled to leave a coating on the sheets which is enamel-like and highly resistant to the action of air and moisture.

Graphite mold. J. H. L. DE BATS. U. S. 1,359,156, Nov. 16. A mold formed of compressed flaked graphite is used for casting high-speed steel, Cu, Ni, glass or other materials.

Soldering flux. E. L. WILLIAMS. U. S. 1,359,010, Nov. 16. A flux adapted for use in soldering small springs is formed of alc. 100, rosin 100 and aromatic spirits of ammonia 25 parts.

Uniting metals. O. S. DEZIEL. Brit. 149,793, May 28, 1919. Parts to be welded or united are heated by immersion in a bath of molten metal at a comparatively low temp. and then raising the temp. of the bath to the required degree. A Pb bath is suitable for uniting bronze, Cu, cast Fe, wrought Fe, and steel, and the whole process may take place in the bath, the pieces being raised somewhat or floating on the surface of the bath. The process is specially suited for the manuf. of water-jacketed cylinders for internal-combustion engines.

10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER

The acid and basic properties of various compounds. H. I. WATERMAN AND J. GROOT. Univ. technique, Delft. *Rec. trav. chim.* 39, 573-7 (1920).—Cf. C. A. 15, 238 (1921). E. J. WITZEMANN

***o*-Sulfonylbenzoic anhydride and benzamide- and methylbenzamide-*o*-sulfonic acids.** H. J. TAVERNE. Univ. Leyden. *Rec. trav. chim.* 39, 542-8 (1920).—T. has repeated the prepn. of *o*-sulfonylbenzoic anhydride (A) by Sohon's method (*Am. Chem. J.* 20, 258 (1888)) from dry K *o*-sulfonylbenzoate and PCl_5 and found that without heating the reaction takes place rapidly. After standing 1 hr. the $POCl_5$ was evapd. by heating *in vacuo* on a H_2O -bath. The product thus obtained is white, which is not true when Sohon's instructions are followed. T. also used the method of Fahlberg and Barge (*Ber.* 22, 757 (1889)), using *o*-sulfonylbenzoic acid and $AcCl$. The m. p. of the A obtained was 130° and its mol. wt. 184. T. proved the constitution of A by converting it into o - $H_2NOCC_6H_4SO_3NH_4$ by satg. A in C_6H_6 with NH_3 ; it seps. as fine needles, m. 259° . In order to obtain the free acid the NH_4 salt was first converted into the Ba salt,

($\text{H}_2\text{NOCC}_6\text{H}_4\text{SO}_4)_2\text{Ba} \cdot 6\text{H}_2\text{O}$, by boiling with excess BaCO_3 . The free acid was obtained by adding the calcd. amt. of dil. H_2SO_4 , filtering and concg. on the H_2O -bath after which the evapn. was continued in a desiccator: crystals, m. 186° (Jesurun, *Ber.* 26, 2289 (1893)). The Ag salt ($\text{H}_2\text{NOCC}_6\text{H}_4\text{SO}_4\text{Ag} \cdot \text{H}_2\text{O}$), was also prepd. A in C_6H_6 treated with gaseous MeNH_2 gave a white ppt. of the *methylammonium methylbenzamide-sulfonate*, m. 189-90°. The MeNH_2 salt in H_2O with freshly pptd. BaCO_3 gave the *free acid* which was analyzed as the barium salt, $(\text{NHMeOCC}_6\text{H}_4\text{SO}_4)_2\text{Ba} \cdot 4\text{H}_2\text{O}$. On boiling with KOH this salt liberates MeNH_2 .

E. J. WITZMANN

Some relations between the configuration and the optical rotatory power of some derivatives of acids of the sugar group. Miss TH. W. J. VAN MARLE. Univ. Leyden. *Rec. trav. chim.* 39, 549-72 (1920).—Van't Hoff studied the influence of the cyclic bond on the quantity of rotation. It is capable of changing the sign. Thus the lactones derived from sugar acids have a rotatory power equal to that of the corresponding sugars, while the als. obtained by their reduction and the acids formed by their oxidation have on the contrary a feeble rotation. If the rotation of the lactones is the consequence of this cycle the sign of the rotation of the lactone will be detd. by the place of the cycle. Hudson (*C. A.* 4, 1466) has stated the following hypothesis: Lactones of *d*-rotation have the lactonic ring on one side of the structure, lactones of *l*-rotation have it on the other, and the position of the ring shows the former position of the OH group on the γ -C atom. This rule was verified by H. and by Anderson (*C. A.* 6, 737) for many acid lactones. Later H. (*C. A.* 11, 1426) also found the following rule: The direction of rotation of the phenylhydrazide indicates the configuration of the HO of the α -C atom. If the phenylhydrazide rotates to the right, the HO on the α -C is on the right and *vice versa*. In this paper Miss v. M. has tested the latter rule for a series of substituted hydrazides. *Hydrazides of some hexonic and pentonic acids and some of their derivs.* The hydrazides of hexonic and pentonic acids are easily obtained by boiling their lactones in EtOH with $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$ under a condenser. They often sep. as crystals. 3.6 g. *d*-gluconic acid lactone are dissolved in 50 cc. 96% boiling EtOH and after some preliminary treatment 1 cc. of 90% $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$ is added and the mixt. heated. The *d*-gluconic acid hydrazide (A) (Weerman *C. A.* 12, 1465) seps. as colorless tabular crystals, m. 142°, $[\alpha]_D^{25} 30.4^\circ$ in H_2O , 20.9° in $\text{C}_6\text{H}_5\text{N}$. 1 g. A in 10 cc. H_2O + an equimol. amt. of BzH gave the benzalhydrazide, colorless, m. 157° $[\alpha]_D^{25} +46.6^\circ$ in $\text{C}_6\text{H}_5\text{N}$. A treated similarly with *p*- $\text{MeOC}_6\text{H}_4\text{CHO}$ gave *d*-gluconic acid *p*-methoxybenzalhydrazide, m. 183° (decompn.), $[\alpha]_D^{25} 54.0^\circ$ in $\text{C}_6\text{H}_5\text{N}$. *d*-Mannonic acid lactone treated as with A gave *α*-mannonic acid hydrazide (B), colorless spangles, m. 161° (decompn.), $[\alpha]_D^{25} -2.7^\circ$, -3.0° in H_2O , -38.8° in $\text{C}_6\text{H}_5\text{N}$. B treated as above with BzH gave the benzalhydrazide, colorless, m. 194° (decompn.), $[\alpha]_D^{25} -8.0^\circ$ in $\text{C}_6\text{H}_5\text{N}$. The *p*-methoxybenzalhydrazide of B seps. as colorless crystals, m. 191° (decompn.), $[\alpha]_D^{25} -18.8^\circ$ in $\text{C}_6\text{H}_5\text{N}$. *d*-Galactonic acid hydrazide (C) was obtained as microcrystals, m. 178°, $[\alpha]_D^{25} 40.1^\circ$ in H_2O , 31.1° in $\text{C}_6\text{H}_5\text{N}$. The benzalhydrazide of C forms colorless spangles, m. 193° (decompn.), $[\alpha]_D^{25} 63.4^\circ$ in $\text{C}_6\text{H}_5\text{N}$. The *p*-methoxybenzalhydrazide of C forms colorless crystals, m. 191° (decompn.), $[\alpha]_D^{25} 67.7^\circ$ in $\text{C}_6\text{H}_5\text{N}$, decomp. in H_2O . *l*-Gulonic acid hydrazide (D) is a sirup which could not be crystd., $[\alpha]_D^{25} 4.3^\circ$ in H_2O . The benzalhydrazide of D seps. as colorless spangles, m. 173° (decomp. 183°), $[\alpha]_D^{25} -11.2^\circ$ in $\text{C}_6\text{H}_5\text{N}$. The *p*-methoxybenzalhydrazide of D seps. as shining colorless spangles, m. 176-7° (decompn.), $[\alpha]_D^{25} -2.9^\circ$ in $\text{C}_6\text{H}_5\text{N}$. *l*-Idonic acid hydrazide (E) was obtained as a sirup, $[\alpha]_D^{25} -21.8^\circ$ in H_2O . The benzalhydrazide of E seps. as colorless crystals, m. 153°, ($[\alpha]$ is not given). *Iosaccharic acid hydrazide* (F) was obtained as a sirup, $[\alpha]_D^{25} -11.6^\circ$ in H_2O . The benzalhydrazide of F seps. as pretty colorless spangles, m. 147° if heated slowly and 140-4° if heated rapidly, $[\alpha]_D^{25} -48.2^\circ$ in $\text{C}_6\text{H}_5\text{N}$. The *p*-methoxybenzalhydrazide of F seps. as colorless crystals, m. 138° (decompn.), $[\alpha]_D^{25} -36.2^\circ$ in $\text{C}_6\text{H}_5\text{N}$. *l*-Arabonic acid hydrazide (G) seps. as colorless spangles, m. 138°,

$[\alpha]_D^{12}$ 52.6° in H_2O , 61.8° in $\text{C}_6\text{H}_5\text{N}$. The *benzalhydrazide* of G forms colorless spangles, m. 208° (decompn.), $[\alpha]_D^{17}$ 81.3° in $\text{C}_6\text{H}_5\text{N}$. The *p-methoxybenzalhydroside* of G forms colorless crystals, m. 208° (decompn.), $[\alpha]_D^{17}$ 81.7° in $\text{C}_6\text{H}_5\text{N}$. *d-Ribonic acid hydraside* (H) gave colorless crystals, m. 150°, $[\alpha]_D^{15}$ 27.5°. The *benzalhydrazide* of H gave colorless crystals, m. 138–42° (decompn.) ($[\alpha]$ not given). *l-Xyloic acid hydraside* (I) was obtained as a viscous mass, $[\alpha]_D^{15}$ 34.5°. The *benzalhydrazide* of I gave colorless crystals, m. 153–5° ($[\alpha]$ not given). *d-Lyxonic acid hydraside* (J) gave colorless spangles, m. 188°, $[\alpha]_D^{14}$ –3.6° in H_2O . The *benzalhydrazide* of J seps. as a colorless compd., m. 175° (decompn.) ($[\alpha]$ not given). *p-Bromophenyl- and p-, o- and m-tolylhydrazides of some hexonic and pentonic acids*. These hydrazides are easily obtained by boiling the acid lactones in EtOH with equimol. amts. of the substituted hydrazine and generally sep. as colorless crystals although sometimes they are obtained as sirups. They are generally little sol. in boiling H_2O which decomps. them slowly. The *p-bromophenylhydrazide* of *d*-gluconic acid (K) m. 203° (decompn.), $[\alpha]_D^{20}$ 3.6° in H_2O , $[\alpha]_D^{19.5}$ –15.3° in $\text{C}_6\text{H}_5\text{N}$. The *p-tolylhydrazide* of K m. 204°, $[\alpha]_D^{19}$ 5.0° in H_2O , $[\alpha]_D^{21}$ 2.0° in $\text{C}_6\text{H}_5\text{N}$. The *o-isomer* m. 218° (decompn.), $[\alpha]_D^{22}$ 13.7° in H_2O , $[\alpha]_D^{17}$ 5.1° in $\text{C}_6\text{H}_5\text{N}$. The *m-isomer* m. 185° (decompn.), $[\alpha]_D^{16}$ 4.5° in H_2O , $[\alpha]_D^{19}$ 2.7° in $\text{C}_6\text{H}_5\text{N}$. The *p-bromophenylhydrazide* of *d-mannonic acid* (L) m. 225° (decompn.), $[\alpha]_D^{25}$ –7.1° in H_2O , $[\alpha]_D^{19}$ –24.9° in $\text{C}_6\text{H}_5\text{N}$. The *p-tolylhydrazide* of L m. 208° (decompn.), $[\alpha]_D^{15}$ –10.9°, $[\alpha]_D^{14}$ –24.8°. The *o-isomer* m. 208° (decompn.), $[\alpha]_D^{16}$ –8.7° in H_2O , $[\alpha]_D^{14}$ –28.6° in $\text{C}_6\text{H}_5\text{N}$. The *m-isomer* m. 214° (decompn.), $[\alpha]_D^{22}$ –12.5° in H_2O , $[\alpha]_D^{14}$ –24.7° in $\text{C}_6\text{H}_5\text{N}$. The *p-bromophenylhydrazide* of *d-galactonic acid* (M) m. 125° (decompn.), $[\alpha]_D^{19}$ 2.5° in H_2O , $[\alpha]_D^{10}$ –30.3° in $\text{C}_6\text{H}_5\text{N}$. The *p-tolylhydrazide* of M m. 212° (decompn.), $[\alpha]_D^{16}$ 2.9° in H_2O , $[\alpha]_D^{19}$ –13.5° in $\text{C}_6\text{H}_5\text{N}$. The *o-isomer* m. 191° (decompn.), $[\alpha]_D^{12.5}$ 12.2° in H_2O , $[\alpha]_D^{19}$ –8.6° in $\text{C}_6\text{H}_5\text{N}$. The *m-isomer* m. 174° (decompn.), $[\alpha]_D^{13}$ 0.8° in H_2O , $[\alpha]_D^{14}$ –15.8° in $\text{C}_6\text{H}_5\text{N}$. *p-Bromophenylhydrazide* of *l-gulonic acid* (N) could not be purified. The *p-tolylhydrazide* of N was not purified. The *p-tolylhydrazide* of *l-idonic acid* could not be purified. *p-Bromophenylhydrazide* of *l-arabonic acid* (O) m. 204° (decompn.), $[\alpha]_D^{27}$ 2.4° in H_2O , $[\alpha]_D^{19}$ –19.0° in $\text{C}_6\text{H}_5\text{N}$. The *p-tolylhydrazide* of O m. 216° (decompn.), $[\alpha]_D^{15}$ 4.08° in H_2O , $[\alpha]_D^{14}$ –3.1° in $\text{C}_6\text{H}_5\text{N}$. The *o-isomer* m. 203° (decompn.), $[\alpha]_D^{19}$ 26.6° in H_2O , $[\alpha]_D^{14}$ –1.4° in $\text{C}_6\text{H}_5\text{N}$. The *m-isomer* m. 185° (decompn.), $[\alpha]_D^{16}$ 4.6° in H_2O , $[\alpha]_D^{14}$ –5.0° in $\text{C}_6\text{H}_5\text{N}$. The *p-bromophenylhydrazide* of *d-ribonic acid* m. 169° (decompn.) $[\alpha]_D^{16}$ 3.8° in H_2O , $[\alpha]_D^{10}$ 14.0° in $\text{C}_6\text{H}_5\text{N}$. The similar deriv. of *l-xyloic acid* could not be crystd. *Anilides and p-, o- and m-toluidides of some hexonic and pentonic acids*. These compds. were easily obtained by heating the lactone with the calcd. amt. of the NH_2 compd. but it is necessary to control the temp. carefully. The excess of the NH_2 compd. is removed by extg. with Et₂O and the product is crystd. from EtOH. The anilide of *d-gluconic acid* (P) was prep'd. by Fischer and Passmore (Ber. 22, 2736 (1890)), $[\alpha]_D^{11}$ 50.0° in H_2O . The *p-toluidide* of P m. 181°, $[\alpha]_D^{14}$ 50.9°. The anilide of *d-galactonic acid* (Q) was prep'd. by Kohn (Monatsh. 16, 342 (1895)), $[\alpha]_D^{17}$ 62.6° in H_2O . The *p-toluidide* of Q m. 224° (decompn.) $[\alpha]_D^{16}$ 72.9°. The *o-isomer* m. 204°, $[\alpha]_D^{11}$ 49.9°. The *m-isomer* m. 212°, $[\alpha]_D^{14.5}$ 63.3°. The anilide of *l-arabonic acid* (R) m. 204°, $[\alpha]_D^{19}$ 68.1°. The *p-toluidide* of R m. 200°, $[\alpha]_D^{17}$ 68.2°. The *o-isomer* m. 172°, $[\alpha]_D^{11}$ 56.5°. The *m-isomer* m. 186°, $[\alpha]_D^{13}$ 67.7°. The results show that Hudson's rule quoted above holds for the compds. investigated in this paper when the rotation is measured in H_2O but not in $\text{C}_6\text{H}_5\text{N}$. The strong positive influence on the rotation exercised by the introduction of Ph and tolyl groups in the amides observed by Freudler, Guye, Walden, etc., was also found in these sugar derivs. The rotation of the *o*-, *m*- and *p*-toluidides increases in the order given. In the hydrazides the influence of the introduction of substituents was not so sharp. In general these substituted hydrazides were very little sol. in H_2O . The substituted phenylhydrazides were in

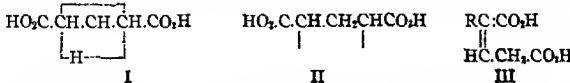
general slow in crystg. and frequently gave jellies. The results are summarized in 2 large tables.

E. J. WITZEMANN

Examination of the nitro compounds with the aid of titanium chloride and sulfate. C. F. VAN DUIN. Amsterdam. *Rec. trav. chim.* 39, 578-85 (1920).—v. D. has previously (*C. A.* 13, 3113) shown that the method recommended by Knecht (*Ber.* 36, 166 (1903)) for the quant. detn. of NO_2 compds. by reduction with TiCl_3 does not give useful results in a medium strongly acid and that the blanks must be run with the reagent. Knecht and Hübbert state that strongly acid solns. must not be used with nitronaphthalenes and v. D. has found that with $\alpha\text{-C}_6\text{H}_4\text{NO}_2$ (A) the apparent N content diminishes as the HCl content of the soln. increases. In this case it was suspected that the NH_2 deriv. is formed by the intermediate stages of hydroxylamine and chloroamine deriv. If this is correct it ought to be possible to use $\text{Ti}_2(\text{SO}_4)_3$ in place of TiCl_3 in H_2SO_4 and obtain accurate results. This was confirmed with A thus: 15 cc. of alc. A were reduced with 40 cc. ± 0.08 N $\text{Ti}_2(\text{SO}_4)_3$ + 20 cc. ± 10 N H_2SO_4 . 7.92, 8.04 and 7.92% N were obtained while the calcd. amt. is 8.09% N. v. D. previously suggested that the HCl gives rise to a slow transformation of Ti^{III} into Ti^{IV} but he has now found that this is incorrect. Knecht showed that TiCl_3 may be used for the partial reduction of poly- NO_2 compds. v. D. tried this method for the prepn. of 3,5-(O_2N)₂ $\text{C}_6\text{H}_4\text{NH}_2$ (B) from *sym*- $\text{C}_6\text{H}_4\text{(NO}_2\text{)}_2$ (C) which several authors had tried without success. B was easily prep'd. as follows: To 10 g. C in 300 cc. boiling EtOH was added 304 g. of a 14.4% soln. of TiCl_3 in the course of 30 mins. The mixt. was filtered to sep. the TiO_2 formed and washed with hot EtOH. After evapg. the EtOH a mixt. of B and C was obtained from which B was extd. with hot 25% HCl. B was pptd. from this soln. with NH_4OH : yield 50%, m. 162°. The TiO_2 treated with Zn + HCl gives TiCl_3 again, which may be used. The formation of tetra- NO_2 compds. takes place easily by nitration with sulfonic acid of the corresponding *m*- NO_2 compd. in which the NO_2 in position 3 has certainly the NO_2 structure. However, von Romburgh and Schepers (*C. A.* 8, 3656) working on tetraniophenylmethylnitramine (D) showed that the group in 3 ought to be considered ONO for reasons given. In order to det. the structure of this group at 3 v. D. tried to obtain trinitro-*m*-phenylenediamine by partial reduction of 2,3,4,6-(O_2N)₂ $\text{C}_6\text{H}_4\text{NH}_2$ (E) with TiCl_3 , but failed. If an ONO group is present this on reduction should give OH and NH_2 and in this way the structure of this group would be established. When 0.273 g. E in 100 cc. glacial AcOH were treated with 53 cc. 0.876 N TiCl_3 (or twice the necessary amt. for complete reduction) at 70° and finally alkalized with NaOH and distd. into 0.1 N H_2SO_4 only 1.84 and 1.58 cc. of the acid were neutralized. At least 10 cc. should have been neutralized by the NH_2 formed if the group at 3 is ONO. This showed that all the NO_2 groups in E have the normal structure. Similar expts. with D failed to show the presence of an ONO group. The formation of trinitromethyl-nitraminophenol and of alkyl nitrite under the action of certain alkalies may be explained by a rapid hydrolysis of the primary ether formed by the H_2O produced in the reaction. For examples cf. v. D. (*C. A.* 13, 2507).

E. J. WITZEMANN

Bromination of glutamic acid and its diethyl ether. P. E. VERKADR AND J. Coors, Jr. Univ. de Commerce, Rotterdam. *Rec. trav. chim.* 39, 586-93 (1920).—Some years ago V. (Verslag Akad. Wetenschappen Amsterdam 24, I527 (1916)) (cf. *C. A.* 10, 1183, 2711) suggested that only the modification of glutamic acid (A) having a normal structure and best represented by Formula I and by II according to Thorpe (*C. A.*



6, 3409), will easily form di-Br addition products. Feist and Thorpe have both succeeded

in preparing labile isomers (III) of several alkyl substituted glutaconic acids by hydrating their hydroxy anhydrides. Treated similarly the anhydride of A (6-hydroxy- α -pyrone) is not converted into a labile modification but nevertheless it has a tendency to form derivs. of the labile form. In the case of the α , α -dimethyl- α , α , β - or α , α , γ -trimethyl derivs. of A the mobile H is missing and one has to do only with the *cis-trans* isomerism. These pairs show marked differences in behavior toward Br (Perkin): The *cis*-forms absorb the calcd. amt. of Br rapidly while the *trans*-forms absorb it slowly if at all. V. and C. accordingly assumed that A may be transformed into the labile form through the action of Br vapors to give finally α , β -dibromoglutamic acid (B) which was confirmed. 10 g. A finely powdered was exposed for 36 hrs. to excess of Br vapors. The product was taken up in dry Et_2O which after evapn. gave a residue which was pulverized and again exposed to Br for 36 hrs. No HBr was produced and therefore no H substituted. The product weighed 21.3 g. B was obtained as colorless crystals, m. 157° (slight decompn.). The two α , γ -dibromoglutamic acids (C) m. 169-70° and 143°, resp. B with Zn dust + dil. H_2SO_4 gives only glutaconic acid and not glutaric acid as the above di-Br derivs. do. Of the 2 possible isomers V. and C. think that all things considered B is probably the *trans*-form. The mother liquors from B were carefully examd. to see if either form of C could be isolated but without success. Bromination of A in H_2O gave a 47% yield of B; in anhydrous HCO_2H (d. 1.22) a 78% yield of B was obtained. In both cases some HBr was formed but the products of the secondary reactions have not been identified. Di-Et glutaconate (D) was prep'd. according to Blaise (*Bull. soc. chim.* [3] 29, 1013 (1903)) from $\text{CO}(\text{CH}_2\text{CO}_2\text{H})_2$. Feist (*C. A.* 5, 1432) obtained 85% of a di-Et dibromogluturate (E) by brominating D but also obtained HBr. When the dry ester is brominated at room temp. as with A above the reaction is complete in 12 hrs.; yield 80-85%. E is a colorless liquid with a pungent odor, b. 135-6°, b₁, 168-9° (some decompn.). E was debrominated in abs. MeOH with Zn or in glacial AcOH with Zn dust. In both cases only glutaconic acid was obtained. This is thought to prove that the Br atoms in E are bound to the α - and β -C atoms and not to the α - and γ -atoms. *A priori* there is little chance of success in the sapon. of E to obtain B but when heated with 15 cc. of 27% HBr for 3 or 4 hrs. B was obtained and isolated. Results on the bromination of aconitic acid will be reported soon.

E. J. WITZEMANN

Reduction products of hydroxymethylenecamphor. IV. Addition of bases to methylenecamphor. HANS RUPP AND WALTER KUSSMAUL. Basel. *Helvetica chim. acta* 3, 515-40 (1920).—Having shown that hydroxymethylenecamphor (A) condenses with bases to form stereoisomeric derivs. of aminomethylenecamphor (B) (*C. A.* 13, 1839 (1919)) R. and K. attempted to prep. camphomethylamine (C), $\text{CO.C}_6\text{H}_4.\text{CHCH}_2\text{NH}_2$.

C was not obtained, but two isomeric di[camphomethyl]amines resulted. Camphylbromomethane (from methylenecamphor (D) and HBr in AcOH) dissolved in 1 part C_6H_6 and 5 parts alc., satd. with NH_3 in a freezing mixt. and let stand sealed 5 days at room temp., gave 50% D (volatile with steam) and 35.5% of the hydrobromide of di[camphomethyl]amine (E), readily sol. in alc., sol. in 50 parts hot H_2O , sepg. in fine, white leaflets darkening and sintering "suddenly" at 285°, but not melting up to 350°. Treating this salt with excess of alkali, shaking out the free E with Et_2O , evapn. and adding alc. (CO_2H)₂, gave the characteristic *oxalate* of E, sol. 0.2% in hot H_2O , fine leaflets, m. 190-1° (decompn.) on very slow heating. Camphylcarbinol heated 10 hrs. at 150° (bomb tube) with either alc. or H_2O satd. with NH_3 , also gave E in 38% yield, along with a little D. D allowed to stand 12 hrs. with concd. alc. NH_3 , gave 4.4% E; this was increased to 67% on letting stand 3 days and then heating 15 hrs. at 80°. *Hydrochloride*, E.HCl, leaflets or needles of intense and lasting bitter taste, insol. in Et_2O , difficultly in water, readily in alc., sinters about 270°, does not m. 350°.

Chloroplatinate, $\text{E}, \text{H}_2\text{PtCl}_6$, orange-yellow crystals from hot alc. (difficultly sol.), m. 240° (decompn.). *Free base* (E), from the hydrochloride, amorphous, white mass of slight basic odor, m. 124°, not distillable in vacuum, and too sol. in all solvents to cryst. *Di[camphoromethyl]nitrosamine*, $[(\text{C}_{10}\text{H}_{16}\text{O})\text{CH}_2]_2\text{N}_2\text{O}$, white needles, soften at 100° and m. 106°. *Di[camphoromethyl]benzamide*, from E and BzCl in $\text{C}_6\text{H}_5\text{N}$, needles from hot ligroin, m. 132°; the *acetyl derivative* of E could not be obtained cryst. *Di[camphoromethyl]phenylthiourea*, from equal parts E and PhNCS (much heat generated on mixing), needles from alc., m. 160-1° (on one occasion, a hydride-product of the same compn. was obtained, m. 120-30°, resolidifies, and again m. 142°; this product could not be reproduced). Further attempts were made to produce C by reduction of B ; as Na in alc. reduced the CO group and Na-Hg split off NH_3 , Al-Hg in dry ether was used, H_2O being slowly added as required; an *isomer* (F) of E is obtained, for which the formula $\text{CO.C}_6\text{H}_{11}\text{CMcNHCH}_2\text{CH}_2\text{C}_6\text{H}_5\text{CO}$ is proposed. (It is suggested that C is

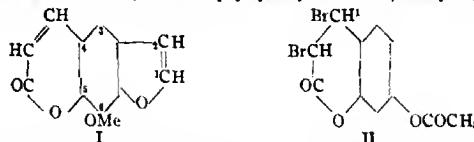
first formed, and in part loses NH_3 to give D . The C and D then unite, forming F). *Hydrochloride*, $\text{F} \cdot \text{HCl}$, sol. 1% in hot H_2O , sepg. in rectangular leaflets (no m. p.). *Chloroplatinate*, $\text{F}, \text{H}_2\text{PtCl}_6$, flesh-colored needles, difficultly sol. in H_2O or alc., decomp. 230°. *Oxalate*, $\text{F}_2\text{H}_2\text{C}_2\text{O}_4$, from F and alc. (CO_2H), more sol. in H_2O and alc. than the oxalate of E , softens 250° and m. 255° (decompn.). *Free base*, amorphous mass, softens 130° and m. 145.6°. *Isodi[camphoromethyl]nitrosamine*, from $\text{F} \cdot \text{HCl}$ by the usual methods, crystals from dil. alc., soften 158° and m. 164°. From the Al-Hg reduction (in ether) of methylenecamphorimine was obtained a base considered to be identical with E . Derivs. of C were however prepd. Camphylbromomethane heated 20 hrs. at 100° with 25% excess of Et_2NH gave a good yield of D but no *diethylcamphoromethylamine* (G); but D and 3 mols. Et_2NH , heated 14 hrs. at 100°, gave 29% G , a yellowish oil of slightly basic odor, $\text{b}_{18.5} 137.5^\circ$ (pure Et_2NH gave a poorer yield than the above, which was gotten with technical amine). *Hydrochloride*, $\text{G} \cdot \text{HCl}$, ptd. from a soln. of G in alc. by HCl ; sol. in H_2O and alc., not in Et_2O ; needles, m. 167-8.5°. *Chloroplatinate*, $\text{G}, \text{H}_2\text{PtCl}_6$, needles from hot water, m. 194°, decomp. 212°. *Chloromethylcamphor* (H) reacts readily with Me_2N in cold 33% abs. alc. soln. to give *methylene-camphor trimethylammoniumchloride* (J), $\text{OC}_6\text{H}_{11}\text{C}(\text{CH}_3)_3\text{CH}_2\text{NH}_3^+$, ptd. by Et_2O

(very hygroscopic); very sol. in H_2O , sol. in alc. (the soln. in H_2O has a very bitter taste), m. 162°; *chloroplatinate*, $\text{J} \cdot \text{PtCl}_6$, orange-red prisms from water, m. 169-70° (slow heating). In solns. containing excess of HCl , J can be boiled without decompn.; on boiling with NaOH , Me_2N is evolved, and A is ptd.; with Na_2CO_3 soln., the products are Me_2N and the anhydride (ether) of A , m. 187°, which on heating with NaOH gives A . Camphylchloromethane, similarly treated with Me_2N and heated to 100°, gave only $\text{Me}_2\text{N} \cdot \text{HCl}$ and D . Camphylbromomethane, on the other hand, heated (under pressure) 15 hrs. at 100° with Me_2N in alc.- Et_2O , gave, besides $\text{Me}_2\text{N} \cdot \text{HBr}$, a product (K), on adding a little Et_2O to the filtrate, and crystg., colorless fine leaflets, softening at 183°, m. 192°, resolidifying and again m. 286° (decompn.). K gives analyses for $\text{OC}_6\text{H}_{11}\text{CHCH}_2\text{NMe}_2\text{Br} \cdot 2\text{NMe}_2\text{HBr}$; and on heating with alkalies, 3 mols. Me_2N are evolved. Further work is promised.

BEN H. NICOLET

Syntheses in the bergaptene group. P. KARRER, A. GLATTFELDER AND FR. WIDMER. Zürich. *Helvetica chim. acta* 3, 541-58 (1920).—Thoms has formulated xanthotoxin (I) from *Fagara xanthoxyloides* as 6-methoxycoumarincoumarone and bergaptene from bergamot oil as 3-methoxycoumarincoumarone (A). This is a preliminary report of attempts to synthesize such products. Four grams of 2-methyl-5-hydroxycoumarone in 40 cc. abs. Et_2O containing 5 cc. abs. HCN were treated with 1 g. powdered dry ZnCl_2 , and HCl passed in, cooling with ice water. The *hydrochloride* of

2-methyl-5-hydroxycoumarone 4-aldimide (B) sep'd. and was filtered off and washed with Et_2O . Boiled with H_2O , B gave *2-methyl-5-hydroxycoumarone 4-aldehyde* (C), needles,



difficultly sol. in hot H_2O , readily sol. in alc., m. 181°; *oxime* of C, readily sol. in alc. or Et_2O , difficultly sol. in ligroin, m. 186° (decompn.); *anil* of C, from PhNH_2HCl and C in hot dil. alc., yellow needles m. 160° (decompn.); *phenylhydrazone* of C, crystals from dil. alc. m. 165° (decompn.). By Perkin's reaction C gave an "intermediate product," readily sol. in Et_2O , C_6H_6 , or alc., insol. in cold H_2O or alkalies, which should be 2-methylcoumarincoumarone, but is not (C, 65.8–67.3%; H, 4.5–4.7%). This, on boiling with water or dil. alc., gives *2-methyl-5-hydroxycoumarone-4-acrylic acid* (D), yellow needles from C_6H_6 , sol. in alkalies or NaHCO_3 , sublimes when heated in vacuum (m. 201°). Methylation of D with Me_2SO_4 in aq. alkali gave *methyl 2-methyl-5-methoxycoumarone-4-acrylate*, yellow needles, m. 216°, readily sol. in C_6H_6 , alc., or Et_2O , difficultly sol. in ligroin, insol. in cold H_2O or aq. alkalies. Methylation in strong alk. soln. gave instead the *free methoxy acid*, yellow needles m. 209°, sol. in alkalies. Like C, but starting with 2-methyl-5-hydroxycoumarone, *2-methyl-5-hydroxycoumarone-4-aldehyde* (E) was obtained, needles m. 185°, sol. in alc., difficultly sol. in hot H_2O , sublimes in white needles; *oxime*, m. 190° (decompn.); the anil and hydrazone were prep'd. as cryst. compds., but not analyzed. Like D, E yielded by Perkin's reaction an "intermediate product" of unknown constitution, which hydrolyzed readily to give *2-methyl-5-hydroxycoumarone-4-acrylic acid*, yellow needles from C_6H_6 , m. 208°, readily sol. in alc., Et_2O , and aq. alkalies. 5-Acetoxycoumarin in 2 parts CHCl_3 slowly treated with 1 mol. Br_2 in CHCl_3 and (after evapn.) extd. with Et_2O to remove impurities, gave "*7-acetoxycoumarin dibromide*" (II), crystd. quickly from abs. alc. in the dark, m. 114° (decompn.); on heating or allowing to stand, Br_2 is given off. 20 g. II in abs. alc. containing 40 g. KOH , boiled 15 mins., dild. with H_2O , the alc. distilled off, cooled, and acidified with dil. HCl , gave *5-hydroxycoumarilic acid* (F), white leaflets from much hot H_2O , or from Et_2O and ligroin, m. 234–6° (decompn.). Pure F, mixed with 3 parts CaO and rapidly distd., gave *5-hydroxycoumarone* (G) (3 g. from 220 g. resorcinol), readily sol. in alc. and Et_2O , less so in C_6H_6 and ligroin, flat needles, m. 56°, giving a green color with FeCl_3 in alc., and a red resin with concd. H_2SO_4 . From G, by the method used for C, *5-hydroxycoumarone-4-aldehyde* (H), readily sol. in Et_2O and alc., very difficultly sol. in H_2O , partly decompd., but not melted, at 260°, was made. From H, by Perkin's reaction was obtained an amorphous product, not sublimalbe, which was not "coumarincoumarone." Mixing 1 atom Na (in abs. alc.), 1 mol. 3,5-(HO)₂ $\text{C}_6\text{H}_3\text{OMe}$, and 1 mol. $\text{AcCHClCO}_2\text{Et}$, refluxing 15 hrs., distg. off the alc., and extg. with Et_2O , gave a small yield of the *ethyl 2-methyl-3-methoxy-5-hydroxycoumarone-carboxylate*, m. 230°; hydrolysis gave the free acid (J), m. 202° (decompn.). Distd. with CaO , (J) gave a very poor yield of *2-methyl-3-methoxy-5-hydroxycoumarone*, m. 75° (sublimes on heating further). 2-Methyl-5-hydroxycoumarone and $\text{C}_6\text{H}_5\text{CH}_2\text{CN}$ in abs. Et_2O were condensed by ZnCl_2 and dry HCl to a ketimide hydrochloride which readily hydrolyzed to give *2-methyl-4-chloroacetyl-5-hydroxycoumarone* (K), crystals from dil. alc., m. 192°, readily sol. in NaOH . Heating with alkalies did not condense K to a coumaranone deriv.

BEN H. NICOLET

Acetylene derivatives. IV. Attempts to prepare derivatives of diaminoacetylene.
PAUL RUGGLI. Basel. *Helvetica chim. acta* 3, 559–72 (1920); cf. *C. A.* 7, 487, 3737;

II, 1400.— $\text{Cl}_2\text{CHCHCl}_2$ (A) reacts with R_2NH to give, usually, $\text{ClCH}(\text{R}_2\text{NH})\text{CCl}_3$, which does not react further. The very slightly basic Ph_2NH behaves similarly with A, no $\text{Ph}_2\text{NC}(\text{CNP}_2)$ being formed. The degradation of dcrivs. of $\text{HOCC}(\text{COC}_2\text{H}_5)\text{CO}_2\text{H}$ (B) was next tried. 100 g. powdered fumaric acid (C), 100 cc. AcOH , and 50 cc. Br_2 , heated 8 hrs. at 100° in a pressure bottle, cooled, filtered, triturated with 150 cc. AcOH , and again filtered, gave 185–95 g. dihromosuccinic acid. With KOH in MeOH (detailed directions given) this yielded finally 70 g. pure E from each 100 g. of C. E could not be prep'd. from dihromomaleic acid (D) with Zn in $\text{C}_6\text{H}_5\text{N}$ soln., as a *monopyridine salt* of D, m. 120° (decompn.), was formed, but no neutral salt, so that a Zn salt was later ptd., and H evolved. The di-Et ester (E) of B, from B and alc. H_2SO_4 , m. $1-2^\circ$ and has $d_4^{15} 1.0690$; E was also made in 30% yield by refluxing the di-Et ester of D 60 hrs. with Zn dust in C_6H_5 and distg. in vacuum. E reacts readily with (2 mols) NH_2OH in cooled alc. containing excess of NaOEt , giving the *disodium salt of the monohydroxamic acid* of B (the analytical data agree better for $\text{NaO}_2\text{CCH}_2\text{C}(\text{NOH})\text{CO}_2\text{Na}$, but the above formula is preferred because solns. gave the hydroxamic acid reaction with FeCl_3). The free acid could not be isolated, and not enough of the Bz deriv. could be made to attempt a Lossen rearrangement. 4 g. of B treated with 15 g. PCl_3 in a freezing mist, and distd. in vacuum gave 2.7 g. chlorofumaryl dichloride (F), $\text{CICOCCl}_2\text{CHCOCl}$, b.p. $73-5^\circ$. F was also obtained in attempting to prep. the acid chloride of B with PCl_3 ; SOCl_2 does not react with B even on boiling. Attempts to prep. the chloride of B from $\text{BrMgC}_2\text{CMgBr}$ and COCl_2 gave only tar. As $(\text{NH}_2)_2$ adds to the triple bond of B, dihromofumaric acid hydrazide (G) was investigated. Dihromofumaric acid was made from B according to Ott (C. A. 7, 599(1913)) or Lossen (Ann. 348, 324(1906)); its acid chloride treated in Et_2O -ligroin with $\text{N}_2\text{H}_4\text{H}_2\text{O}$, let stand a short time, the partly solid oil spread on a porcelain plate, let stand 0.5 hr. over H_2SO_4 , powdered, and extd. with abs. MeOH , decolorized thoroughly, concd., and let cryst., gave a little *dihromofumaric acid dihydrazide* (H), m. 154° (decompn.); sol. in hot alc., difficultly sol. in C_6H_5 , moderately sol. in cold H_2O . The preparation must be carried through without delay. A satd. soln. of A in cold water, treated (cold) with a slight excess of NaNO_2 in dil. AcOH , let stand 1 hr., and filtered cold, gave the *diazide* as a white powder, too explosive to analyze; on warming with alc., a cryst. product, supposedly the dicarboxylate of diamino-dibromoethylene, is formed, which will be studied further. 2,4,5-Tribromoglyoxaline (Wyss. Ber. 10, 1370(1877)) was benzoylated with BzCl in $\text{C}_6\text{H}_5\text{N}$. Instead of the expected $(\text{BzNHCBz})_2$, 3-benzoyl-2,4,5-tribromoglyoxaline was obtained, thick crystals from ligroin, m. $101-2^\circ$.

BEN H. NICOLET

New synthesis of hydrocyanic acid by catalysis. ALPH. MAILHE AND F. DE GODON. *Bull. soc. chim.* 27, 737-9(1920).—Previous syntheses of HCN or NH_2CN from NH_3 and C compds. have required quite high temps. Repeated passage of CO mixed with NH_3 over a ThO_2 catalyst at $410-50^\circ$ gave a 97% yield of NH_2CN . The reaction becomes appreciable at 600° without the catalyst, and at 500° in the presence of finely divided C. With Al_2O_3 and ZrO_2 the reaction begins resp. at $420-50^\circ$ and at 400° . ThO_2 is the most active catalyst tried.

BEN H. NICOLET

d-Glutamic acid. L. HUGOUNENQ AND C. FLORENCE. *Bull. soc. chim.* 27, 750-4(1920).—Glutamic acid (A) was prep'd. as usual by hydrolyzing gluten with HCl . The addition of tin (2% of the wt. of HCl used) (Hlasiwetz and Habermann, *Ann. chim. phys.* 169, 157 (1873)) increased the yield of A.HCl (B) from 12.4% to 18.1% of the gluten used. An improved method of isolating A from B is to add B to 1 part PhNH_2 in 5 parts alc., heat on a water bath till pasty, cool, take up in alc., and filter, washing 2 or 3 times with alc., and cryst. from H_2O . Neutralization of B with $\text{Ca}(\text{OH})_2$ (formerly suggested for isolating A) gives a *double calcium salt* $\text{Ca}_2\text{X}_2\text{CaCl}_2\cdot 2\text{H}_2\text{O}$, insol. in hot alc., readily sol. in H_2O , $[\alpha]_D -2.25^\circ$. B, neutralized with $\text{Cu}(\text{OH})_2$ and concd. in vacuum, gives blue crystals of a *basic copper salt* of A, 5 A.4CuO.7.5H₂O (analysis

on salt dried at 140°); soly. 1.076 g. in 1 l. H_2O . $Cd(OH)_2$ gives with B a *neutral salt* $C_6H_4O_4Cd$, white crystals from H_2O . Salts of Ba, Zn, Hg, Ni, and Co were also prep'd., without obtaining double salts.

BEN H. NICOLET

Additive compound of cinchonine and cacodyl chloride. L. C. MAILLARD AND E. MURLAY. *Bull. soc. chim.* 27, 756-69 (1920).—Cacodyl chloride (A), Me_2AsCl , combines with cinchonine (B) on gentle warming in a dry atmosphere, to give an *equimolecular compound* (C), A · B, decompd. by H_2O sol. with little or no decompn. in $EtOH$ or $AcMe$. C can also be prep'd. by dissolving A and B in $CHCl_3$ at ordinary temp. It seps. as large transparent crystals of C_2CHCl_3 . C is decompd. by Et_2O (probably by the moisture present), giving B·HCl. As C also gives an immediate pptn. of $AgCl$ with $AgNO_3$, it is concluded that it is a quaternary ammonium compound. B. H. N.

The constitution of carbamides. XII. The decomposition of urea when heated in solution in the presence of acids. EMIL ALPHONSE WERNER. Trinity Coll., Dublin. *J. Chem. Soc.* 117, 1078-81 (1920).—In connection with the study of the constitution of urea, a discussion is given of the results of former investigators and of the author as regards the decompn. of urea in presence of acids. If the theory of this decompn.

already put forward by W. (*C. A.* 12, 680) is correct, namely, (I) $HN = C \begin{array}{l} \diagup \\ \diagdown \\ NH_2 \end{array}$ $\longrightarrow (HNCO \rightleftharpoons HO-CN) + NH_3$; (II) $(HNCO \rightleftharpoons HO-CN) + H_2O + HX' \longrightarrow NH_3X' + CO_2$, then all acids should act in a similar way, the weaker acid causing the greater speed of decompn., because the concn. of "free" urea will be greater under these conditions. Tables are given showing the speed of decompn. of urea under varying conditions with different acids. The speed varies as follows: $HOAc \longrightarrow HNO_3 \longrightarrow HCl$. When NH_4NO_3 is added to the HNO_3 or $HOAc$ and NH_4Cl to the HCl , the speed of decompn. is accelerated. This is explained by W. as due to "the increase of velocity of (I) by the hydrolysis of the salts."

ROGER ADAMS

The preparation of guanidine by the interaction of dicyanodiamide and ammonium thiocyanate. EMIL ALPHONSE WERNER AND JAMES BELL. *J. Chem. Soc.* 117, 1133-6 (1920).—A practical method, far superior to any yet described in the literature, is given for making guanidine. 43.5 of technical dicyanodiamide (42 g. pure) and 76 g. of dry NH_4SCN were powdered together and heated in a beaker in a glycerol bath. The beaker was covered with cardboard, through which extended a thermometer for stirring. The mixt. melted at 80°, then was heated to 120° (70 min.) where it was held 3.5 hrs. The viscous mass, while hot, was treated with 250 cc. Na_2O and allowed to cool. By filtering and washing, a residue (A) weighing 7.4 g. was obtained; the filtrate was evapd. at 100° as far as possible and gave 110 g. of dry product; this on dissolving in 200 cc. warm H_2O gave 1.02 g. of insol. residue (B). The filtrate again evapd. at 100°, cooled and seeded with a crystal of guanidine thiocyanate (C) gave 107.1 g. of pure (C) (90.8% theory). A contained the impurities originally present in dicyanodiamide and 5.4 g. thioumeline which was sepd. by treatment with $NaOH$ soln., filtering, and pptg. with CO_2 . B consisted of pure thioumeline. To sep. C completely in cryst. form was tedious; hence the guanidine may be recovered as carbonate by treating the viscous aq. soln. of guanidine thiocyanate with 4 vols. $EtOH$, adding the calcd. amt. of KOH , then pptg. with CO_2 . To explain the above results, the dicyanodiamide must depolymerize to cyanamide before combining with the NH_4SCN . ROGER ADAMS

The synthesis of some nitro derivatives of toluene. OSCAR LISLE BRADY AND PIERCY NOEL WILLIAMS. *J. Chem. Soc.* 117, 1137-40 (1920).—3,4-($NO_2)_2C_6H_3Me$ (A) has been prep'd. by the following series of reactions: $2-NH_2C_6H_4Me$ (B) \longrightarrow $2,4-NH_2-(NO_2)C_6H_3Me$ (C) \longrightarrow $2,4-NHAc-(NO_2)C_6H_3Me$ (D) \longrightarrow $2,4,5-NHAc-(NO_2)_2C_6H_2Me$ (E) + $2,3,4-NHAc-(NO_2)C_6H_2Me$ (F) \longrightarrow A. The yields except in the last step are good. 100 g. B are dissolved in 1087 cc. H_2SO_4 (d. 1.8), keeping the temp. from ris-

ing, cooling to 0° and holding there during nitration. To this soln. is added a mixt. (cooled to 0°) of 163 cc. H₂SO₄ (d. 1.8) and 50.8 cc. HNO₃ (d. 1.42); the whole is allowed to stand 1 hr. Now with stirring and cooling, half its volume of H₂O is added, and on standing, the sulfate of (C) crysts. out (60% yield) while the sulfate of 2,6-NH₂(NO₂)-C₆H₃Me remains in soln. C is obtained by treating the sulfate with a slight excess of 10% NaOH, is washed, dried and acetylated to D with Ac₂O. D dissolved in concd. H₂SO₄ and treated with HNO₃ (d. 1.5) at 0°, allowed to stand 30 min., then poured into H₂O gives a mixt. of E and F (70-80% yield). 50 g. of E and F are hydrolyzed by heating at 100° for 4-5 hrs. with 200 cc. concd. H₂SO₄ and 400 cc. H₂O; on cooling, a 45% yield of 3,4-dinitro-o-toluidine (G) seps. yellow-brown plates from EtOH, m. 131°; the H₂SO₄ filtrate on diln. gives a 25% yield of 4,5-dinitro-o-toluidine (H), yellow needles from EtOH, m. 191°. A mixt. of 9 g. of G and H as obtained above is dried and dissolved in 180 cc. abs. EtOH and 45 cc. fuming H₂SO₄ (20% SO₃), then heated at 100° and to it is added, with shaking, 27 g. of powdered NaNO₂; the resulting soln. is heated 5 min., cooled, dild. with H₂O when an oily solid sepd. which on crystn. first from HNO₃ (d. 1.42), then from EtOH and animal charcoal, gives 2 g. of A. 2 g. of H in 10 cc. of 80% H₂SO₄ is added to a mixt. of 7 cc. concd. H₂SO₄, 10 g. (NH₄)₂SO₃ and 20 g. of crushed ice; after standing 12 hrs., dinitronitosotoluene seps. and the maximum amt. is obtained by pptg. with H₂O; this compd. is filtered and added to 10 times its wt. of HNO₃ (d. 1.5) and warmed; cooling and dilg. ppts. 2,4,5-(O₂N)₃C₆H₃Me, purified from EtOH. By similar treatment of G, 2,3,4-(O₂N)₃C₆H₃Me is formed.

ROGER ADAMS

Glycine and its neutral salt addition compounds. HAROLD KING AND ALBERT DONALD PALMER. Dept. Biochemistry, Medical Research Committee. *Biochem. J.* 14, 574-583 (1920).—The results of Pfeiffer and Modelska (*C. A.* 7, 1025, 3764) with regard to the definite nature of the compds. of glycine with Ca, Ba and Sr chlorides, of the type MCl₂(C₂H₅O₂N)₂·H₂O, and with LiCl and LiBr of the types LiCl(or Br)·C₂H₅O₂N·H₂O and LiCl(or Br)·(C₂H₅O₂N)₂·H₂O, are confirmed. K. and P. have not been able to prep. addition compds. of the K halides, but they have succeeded in prep. from NaBr and NaI, addition compds. of the type MBr(or I)(C₂H₅O₂N)₂·H₂O. They support Bayliss's contention of the formation of solid solns. (*Principles of General Physiology* 1915, 105, 220, 281; *C. A.* 10, 1046; *Brit. Assoc. Colloid Rep.* 1919, No. 138; *J. Physiol.* 53, 162 (1919)). From aq. glycine solns. or from solns. of glycine containing neutral salts, they obtained an unstable form of glycine crystg. in long stout needles or columns (see also Ostromuisenskii (*C. A.* 3, 63), Fisher, *Ber.* 38, 2914 (1905); and Falk and Sugiura (*J. Biol. Chem.* 34, 29 (1918), *C. A.* 12, 1186).

BENJAMIN HARROW

Oxidation of quinine with hydrogen peroxide. M. NIERENSTEIN. Univ. Bristol. *Biochem. J.* 14, 572-3 (1920).—H₂O₂ acting on quinine does not give hemoquinic acid but quinone. 10 g. quinine-HCl in 100 cc. water are heated on a water bath for 6 hrs. with 50 cc. H₂O₂ (40 vols. commercial), and the oxidation continued for another 6 hrs. with 50 cc. more of H₂O₂. The calculated quantity of 0.1 N NaOH is now added to neutralize the HCl present, the soln. is extd. several times with ether, and the ether ext. shaken with a 10% NaHCO₃ soln. satd. with CO₂. The aq. layer is acidified and extd. with ether, and the ext. dried over anhydrous Na₂SO₄. The residue when crystd. from dil. alc. yields slender needles (m. 280-2°); N found 8.6, 8.3, 8.2; calcd. for C₁₇H₂₀O₄N₂, 8.2.

BENJAMIN HARROW

The constitution of the humic acids. M. POPP. Oldenburg. *Brennstoff Chem.* 1, 58-9 (1920).—A degradation product of humic acid, named *humalic acid*, by P., was isolated from a mixt. of Ca salts resulting from the process of a Ger. patent granted to P. Brat (no description available—Abstr.). The new acid contains C 43%, H 6%.

and O 51%; equiv. wt. about 350. Both the free acid and all of the salts which were prep'd. are water-sol.; the acid is sol. in alc., insol. in Et_2O , benzene and petr. ether. It reduces Fehling soln. and $\text{NH}_3\text{-AgNO}_3$; it forms a *phenylhydrazone* which is insol. in alc., m. 168°. Alc. ppt. from an NH_4OH soln. of the latter a compd., m. 215°. This aldehydic behavior points to a similarity in its constitution to that of the sugars. As an acid it is approx. as strong as acetic. KMnO_4 oxidizes its soln. to CO_2 . A characteristic test is FeCl_3 soln., then NaOH ; a blood-red color results, without pptn.

W. B. V.

American progress in the bacteriological sugars (RITEL) 21C. The photochemistry of tetrabenzoylethylene (HALBAN, GEIGEL) 3. Catalysis (MAILLIE) 2. Manufacture of fine chemicals in England (ANON.) 13. The alkylamines as solvents (ELSEY) 2. Acetone; butyl alcohols (Brit. pat. 149,355) 16.

Chlorinating hydrocarbons. A. E. HOULEMAN. U. S. 1,358,851. Nov. 16. Regulated chlorination of hydrocarbon liquids such as petroleum naphtha is effected by absorbing Cl in the liquid in the absence of light and then heating the soln. to cause chlorination. An app. is described.

Reducing aromatic nitrogen compounds. T. S. MOORE. U. S. 1,358,324, Nov. 9. Coarsely divided cast Fe and a chloride are used as reducing agents in the reduction of compds. such as *p*-nitrosophenol, *p*-nitrophenol, *o*-nitrophenol, *p*-nitroaniline, *o*-nitroaniline, *p*-nitroacetanilide, *o*-nitroacetanilide, the Na salts of 2-nitro-4-amino-benzenesulfonic acid and *p*-hydroxyazobenzene-*p*-sulfonic acid. Usually CaCl_2 effects reduction about 4 times as fast as NaCl but may not yield a product of as good a quality. FeCl_3 effects reduction somewhat more rapidly than CaCl_2 but may cause some contamination of the product because of developed hydrolytic acidity. Not all related aromatic N derivs. are susceptible of successful reduction by this method and a test is necessary to det. the com. practicability of the process in each instance. E. g., *m*-nitroaniline does not give satisfactory results (as distinguished from *p*-nitroaniline). The reaction is especially suitable when the product is sol. in H_2O as in the case of *p*-aminophenol, *o*-aminophenol and *p*-phenylenediamine. In such cases, the process may be operated continuously by successive reduction of different batches in the same mother liquor. When prep'd. bases which are sol. in H_2O , the use of CaCl_2 instead of NaCl has the advantage that the hydrochloride of the base can be prep'd. by pptn. of the base by HCl , since, in this operation, CaCl_2 is not pptd., but if a strong soln. of NaCl is employed the greater portion of the NaCl is pptd. with the hydrochloride of the base.

Chloroform. M. PHILLIPS. U. S. 1,359,099, Nov. 16. CHCl_3 is obtained from the mixed alc. product made by passing unsatd. hydrocarbons rich in propylene into H_2SO_4 and hydrolyzing the alkyl sulfates thus formed. One part by wt. of the secondary ales. is added to a mixt. formed from chloride of lime 5 and H_2O 20 parts and CHCl_3 is distd. from the reaction mixt. The CHCl_3 seps. as a distinct layer and is washed with dil. NaOH soln., then with H_2O and redistd. This pat. is dedicated to the public so that the process may be used without payment of royalty.

Acetyl chloride. F. J. KAUFMANN. U. S. 1,359,071, Nov. 16. Glacial HOAc is mixed with PCl_5 at a temp. below 50° (preferably below 30°) to avoid reaction between them and Cl is passed into the mass, while still maintaining the temp. preferably at 10-30°, to produce AcCl which is then sep'd. by fractional distn. Other fatty acid halides may be similarly prep'd., e. g., propionyl chloride, butyl chloride or acetyl bromide.

Galactan from western larch. H. F. WEISS. U. S. 1,358,129, Nov. 9. An aq. ext. is made of comminuted western larch wood on the counter-current principle. Extractable material, principally galactan, may amount to 300 lbs. per ton of larch but a materially larger amt. of ext. is obtained if the wood is preliminarily steamed or if the extn. is carried out at an elevated temp. The residue of the extn. is subjected to a chem. pulping process to produce paper stock. The galactan soln. may be recovered in dry form by evapn. or it may be converted into galactose by treatment with dil. H_2SO_4 . Galactose thus obtained may be evapd. to the consistency of a syrup or it may be fermented for the production of alc. or converted into mucic acid by the use of HNO_3 .

Dialkyl sulfates. E. KUH. Brit. 149,688, Aug. 3, 1920. Dialkyl sulfates are prep'd. by vacuum-distg. alkyl acid esters of H_2SO_4 with a neutral salt of a non-volatile dibasic acid or a secondary salt of a non-volatile acid of higher basicity. The added salt takes up the free H_2SO_4 as produced, and thus prevents hydrolysis of the acid ester. In a modification, the formation of free H_2SO_4 is avoided by distg. a mixt. of an alkyl acid sulfate and the corresponding alkyl Na sulfate, which latter may have been produced during an alkylation in alk. soln. Examples are given in which a mixt. of $EtHSO_4$ and anhydrous Na_2SO_4 , or of $EtHSO_4$ and $EtNaSO_4$, is subjected to a vacuum distn. at a pressure of 10-15 mm. of Hg and a temp. of 90-170°.

Fatty acids, etc. F. FISCHER. Brit. 149,974, Aug. 9, 1920. Sol. org. compds. (fatty acids, hydroxy acids, tar acids, etc.) are obtained by the oxidation of coal or other solid combustible matter, such as lignite, peat, wood, etc., by means of air or O under pressure in the presence of aq. or other incombustible liquid. In an example, powdered bituminous coal mixed with soda soln. is treated at 230° with air at 30 atms. pressure. Instead of alk. solns., H_2O , acid solns., pyridine, etc., may be used; emulsifying agents such as soap may be added, or catalysts such as Fe or Mn salts.

II—BIOLOGICAL CHEMISTRY

HATTIE L. HEFT, EDGAR G. MILLER, JR. AND WILLIAM J. GIES

A—GENERAL

FRANK P. UNDERHILL

Studies of the colloidal state of proteins in yeast extract. I. Yeast juice protein in alkaline solution—relation to biological processes. A. FODOR. Univ. Halle a. S. *Kolloid-Z.* 27, 58-69 (1920); cf. *C. A.* 11, 3285; 13, 2883; *Fermentforschung* 3, 193 (1920).—Previous work convinced F. that the kinetics of polypeptide fermentation by yeast juice can be explained only on the theory that the substrate is adsorbed by a colloid in the ext. This investigation was carried out to study the properties of this colloid, and to work out a *theory of the process of fermentation*. *Exptl.*: Treatment of the yeast juice with alc. gives a ppt., only a small part of which will dissolve in H_2O again, giving a soln. baving the fermentative powers of the original juice, and from which a protein is thrown down by acids. This ppt., called the *acid coagulum*, is identical with the protein in the original juice and differs from the rest of the alc. ppt. only in H_2O solv. Since the acid coagulum could be obtained only in small amt. the expts were carried out chiefly with the alc. ppt., called *yeast juice protein*. This is a fluffy, nearly white powder containing 14.98% N and 4.03% P. On dissolving in alkali and repprtg. it contains 13.92% N and only a trace of P. The protein does not swell in H_2O , but shows the typical peptization in dil. $NaOH$. An old sample requires 24-30 hrs. for soln. in 0.1 N $NaOH$ but a freshly prep'd. one dissolves at once. More alkali is required to dissolve the old sample. Drying the freshly prep'd. product in a desiccator causes it to revert to the less rapidly sol. form. On dissolving in alkali

and then neutralizing the alkali with acid, the protein ppts. but redissolves in more acid, a still larger excess again pptg. A 1% soln of the protein in acid was prep'd. and the H^+ concn. varied by adding NaOH. The viscosity was detd. by means of the Ostwald viscosimeter and the H^+ concn. by the gas cell method. The viscosity, which measures the hydration of the protein particles, has a minimum at the isoelec. point and reaches its max. in the region $P_H = 3.18$ to 2.8. These solns. all contained NaCl. The isoelec. point, detd. from the coagulation optimum, is $P_H = 4.6$. To dissolve the protein in alkali requires 5.50×10^{-4} g. equiv. NaOH per g. protein. NaOH solns. containing varying amt. of alkali were prep'd. and measurements made of sp. cond., H^+ concn. and viscosity. The results show: (1) The cond. due to the org. complex attains much higher values than have ever been found for true (not colloidal) org. ions. (2) Up to a certain point the cond. is a linear function of the amt. of NaOH bound by the protein, beyond which the curve bends to a max. (3) The viscosity increases with the NaOH bound, reaching a max. (4) The amt. of NaOH bound on dissolving a given wt. of protein in a given amt. of NaOH is always the same, but the cond. and viscosity are not always the same. For a given amt. of NaOH bound, the cond. is inversely proportional to the viscosity. A study of the OH^- concn. of a NaOH soln. of the protein at different dilns. gave results which could not be interpreted on the basis of electrolytic dissociation of a sodium proteinate. *Theoretical.* Pauli and his pupils explain the behavior of proteins in acid and alk. soln. on the theory that as ampholytes they form salts with acids or bases which are electrolytically dissociated, the complex protein ion being greatly swollen as a result of hydration. The following objections are made to this theory: (1) The laws of elec. dissoci. in dil. solns. are assumed to hold for these complex colloidal ions. (2) The cond. of these protein ions reaches higher values than are ever observed for true org. ions. (3) This theory does not account for the colloidal properties of the proteins. (4) On the basis of this theory Pauli and Matula (C. A. 14, 2348) find by applying Ostwald's rule to the cond. data for NaOH solns. of casein that the caseinate ion is trivalent. The curve of cond. vs. ratio of casein to NaOH should then be divided into 3 sections by 2 "breaks," corresponding to each of the 3 valences. This is not the case. The theory adopted is based on the formation of an adsorption compd. between protein and alkali. The OH^- of the alkali is adsorbed on the surface of the colloidal particles, forming a negatively charged shell. The cation of the alkali is held electrostatically in a positive shell between the charged particle and the dispersion medium. The adsorption results in subdivision of the particles. The rate of increase of dispersity with increase in OH^- adsorbed is not always the same, but depends upon the previous condition of the colloid. The particles of the adsorption complex are swollen by taking up water which forms a shell about the entire complex, which may be represented thus: $[(P - OH)^-Na^+] \leftrightarrow H_2O$. This hydration is greater the less the ratio of OH^- adsorbed to the area of interface. The high cond. of the adsorption complex is due to the ion $(P - OH)^-$. This is not an ion in the usual sense, since the charge is not due to the protein radical itself, but to a foreign ion. The name *heteroion* is given to such ions. Three conditions may therefore obtain: (a) The dispersity increases rapidly with adsorption of OH^- , in which case the charge is spread over a large interface, giving lower cond. and higher hydration. The $\lambda - OH^-$ adsorbed curve is parabolic. (b) The dispersity increases slowly, in which case the cond. is greater and the hydration less. The $\lambda - OH^-$ adsorbed curve is hyperbolic. (c) Between these extremes the curve approaches a linear function. In a previous paper by Abderhalden and Fodor (C. A. 14, 3678) it was shown that the adsorbability of yeast juice protein by charcoal is increased by increasing its dispersity, but diminished by increased hydration. Probably the ability of the protein to adsorb other materials is governed by the same factors. The mechanism of fermentation is there-

fore concluded to be as follows: The ferment colloid plays the part of an adsorbent, binding the substrate. The substrate then reacts with the OH^- of the complex in this interfacial layer, which must be regarded as the seat of biological processes. The optimum fermentation is the resultant of two opposite influences, the first the increased dispersity due to increased adsorption of OH^- , and the second diminution of the adsorption of the substrate by increased hydration. "In a word, as the essential biological conditions for peptolytic and tryptic fermentation, must be considered the colloids which form heteroions upon which OH ions are carried in a potential condition, provided that their action is not hindered by such great hydration as to diminish the adsorptive powers."

F. L. BROWNE

The temperature coefficients of the hydrogen peroxide decomposition by fat catalase. E. NORDERGARD. *Biochem. Z.* 109, 236-40 (1920).—The catalase was obtained from fresh pig kidney fat by extn. with lukewarm H_2O for 3 hrs. at 30° after grinding the tissue with sand. The ext. was cooled to 0°, filtered and ptd. with a mixt. of 5 vols. 96% EtOH and 1 vol. Et₂O. The ppt. was washed on a Büchner funnel with a mixt. of abs. alc. and Et₂O and dried in a vacuum desiccator over KOH. Weighed portions of this residue were shaken with 1 l. H_2O and filtered after 1 hr. and the action of the soln. on 0.02 N H_2O_2 was tested at various temps. The const. *A* of the Arrhenius temp. formula gave for the interval 0-19° the value *A* = 6100 ± 100, which is similar to the value *A* = 6200 for blood catalase. No differences between the enzymes from these 2 sources are evident under the conditions as described.

F. S. HAMMETT

The activity of enzymes under abnormal conditions and the alleged aldehyde nature of enzymes. ELIZABETH RONA. *Biochem. Z.* 109, 279-89 (1920).—When the enzymes pepsin, trypsin, amylase, emulsin, invertase and maltase are caused to exert their activity in the presence of typical substances reacting with the aldehyde group, such as $\text{Na}_2\text{S}_2\text{O}_5$, $\text{NH}_4\text{OH} \cdot \text{HCl}$, Na_2SO_3 , KCN, phenylhydrazine and benzenesulphohydroxamic acid, hydrolysis occurs, provided care is taken to maintain a regular H-ion concn. This is taken as a strong proof against the idea that enzymes exert their activity through the possession of an active aldehyde group. F. S. HAMMETT

Studies on protein reactions. I. A microscopic conductivity method. A. v. SZENT-GYÖRGYI. *Biochem. Z.* 110, 116-8 (1920).—A method is given for the study of the cond. relations of colloid solns. under the microscope. A drop of the fluid to be studied is placed on a slide and covered with a cover glass. From each side of the cover glass lengthwise along the glass slide there is placed a narrow streak of melted agar containing 10% NaCl. The non-polarizable electrodes are laid on these agar streaks about 0.5 to 1 cm. from the cover glass and the effect of a 110-v. const. current on the substance under the cover glass is noted. The drops of material studied should be large enough to exude somewhat from the edges of the cover glass. The concn. of the electrolyte should not exceed 0.1 N. In cases where the particles are not visible blood charcoal can be used as an adsorption material and the direction of its wandering studied. II. The action of electrolytes on serum albumin. *Ibid.* 119-27.—Horse serum which has been dialyzed practically free from salt in a collodion sac, under toluene, at freezing temp. when dild. 15 times with distd. water yields a prepn. that can be used for the study of the effects of electrolytes on proteins by the ultramicroscopic elec. cond. method. With denatured albumin it was found that the univalent cations of highest electron affinity have neither ptn. nor discharging effects. Bivalent cations of higher electron affinity (Ca, Mg) have simply a discharge effect. The other cations of lower electron affinity show both effects at different concns. When native albumin is studied practically the same results are obtained save that the isoelectric point or flocculation max. and the discharge always fall together. F. S. HAMMETT

Influence of colloidal carbohydrate solutions on the peptic digestion of proteins in artificial gastric juice. T. TOGAWA. *Biochem. Z.* 109, 18-24 (1920).—Various mixts. of starch, pepsin, edestin, cow milk, H_2O and HCl were digested at 37° and the residual N was detd. No valid or marked differences were found of such a nature as to allow the idea of a disturbing effect of starch on peptic digestion to be substantiated.

F. S. HAMMETT

Colorimetric studies of tryptophan. I. The tryptophan content of blood serum and milk. OTTO FÜRTH AND ED. NOBEL. *Biochem. Z.* 109, 103-23 (1920).—The literature and methods for the detn. of tryptophan are reviewed. Voisenet's reaction is applied to the study of blood serum and milk as follows: A 0.1% soln. of pure tryptophan in 2% NaF soln. is used as the standard. This standard is not stable over long periods. Measure 2 cc. of the standard into a 25-cc. graduate and add 1 drop of 2.5% $HCHO$. Shake, add 15 cc. concd. HCl mix by pouring into another graduate, add 10 drops of a 0.5% $NaNO_2$ soln., make to 20 cc. with concd. HCl , and again mix by pouring back and forth from one graduate to the other. The max. color development occurs in 5-10 min. Treat the soln. to be measured for tryptophan similarly, using 2-cc. aunts., whether it contains protein or not, and compare the color developed with the standard in the colorimeter; any pptd. protein usually dissolves completely in the concd. HCl present. When there is a ppt., due to an excess of inorg. salts, as occurs when the protein has been dissolved in concd. $NaOH$, this is filtered off. Using this method values are given of the tryptophan content of the albumin and globulin of horse and cow serum and of the globulin of pleural and pericardial exudates, which show definitely that globulin contains nearly 3 times as much of this amino acid as does albumin. The av. tryptophan content of casein was found to be 2.02%, while that of the filtrate obtained after souring lay between 1.8 and 2.3%. The proteins of human milk contain 3.4-6.8% of tryptophan, much more than those of cow milk. Three-fourths of this is found in the fraction after pptn. by souring. Hence it is evident that, although human milk contains less protein than does cow milk, the higher tryptophan content of this protein accounts in part for its favorable growth-promoting characters. II. Methodological study of the colorimetric determination of tryptophan on the basis of the Voisenet reaction, and its application to proteins and organs. OTTO FÜRTH AND FRITZ LIEBBEN. *Ibid.* 124-52.—The reaction as described above is specific (save that indole yields color change somewhat similar) since neither the protein aliphatic amino acids, tyrosine, phenylalanine, histidine nor proline give the color. The reaction is sensitive to 1:50,000 tryptophan and 0.1 mg. can be easily detd. A 0.01% alc.- H_2O soln. of gentian violet is a fair permanent standard for the detn. The reaction is complete within 1/2 hr. if the $NaNO_2$ is added at the beginning of the test, but when added as described the max. color is developed within 10 min. The range of variability on diln. is usually around 10% and does not exceed 20%. Other factors are discussed such as the significance of the $NaNO_2$ action, variations in the $HCHO$ addition, influence of the HCl concn. and disturbing action of H_2O , oxidation and reducing factors, permanency of the color and the stability of the tryptophan soln. When the method is tested out on solns. of various concns. and on gelatin to which tryptophan has been added the error does not exceed 20% and is usually around 10%. The method can be used directly on coagulated and insol. proteins dissolved in $NaOH$. The tryptophan content of various proteins is given as follows: fibrin, 5.3%; Witte's peptone, 5.3%; serum globulin, 4.0%; serum albumin, 1.3%; hemoglobin, 0.0; keratin, 1.2%; values considerably higher than those heretofore given and subject to revision by further study. The tryptophan content of human tissues lies between 0.1 and 0.6%. The liver, spleen and thyroid are particularly rich in this substance, while the brain has but little. III. The splitting off of tryptophan during the digestive process. *Ibid.* 153-64.—Studies

were made of the tryptophan formation from various proteins when subjected to the action of the proteolytic enzymes *in vitro*, by means of the method described in a previous article. When the phosphotungstic-acid pptn. was used it was possible to det. the relative amt. of free and bound tryptophan. When fibrin is digested with trypsin, in spite of careful regulation of the H-ion concn. with phosphate, acetate or borate buffers, rarely more than $\frac{1}{2}$, at the most $\frac{2}{3}$ of the tryptophan is split off as free tryptophan during the course of several weeks, from which it is concluded that there is no ground for attributing to tryptophan a place analogous to that of tyrosine in the structure of the protein mol., since it is not liberated from the protein mol. as is tyrosine in the early phases of digestion, but rather given off gradually as are the other amino acids.

F. S. HAMMETT

Chemical nature of the bee's poison. FERDINAND FLURY. *Arch. exp. Path. Pharm.* 85, 319-39 (1920).—The technical procedures for obtaining the poison from bees are given in great detail. The substance is of extremely complex nature; by fermentative decompn. shown to contain a lipoid, and by hydrolysis capable of fractionation into (1) a N-containing ring form of the indole series, isolated in the form of tryptophan, (2) choline, (3) glycerol, (4) phosphoric acid, (5) palmitic acid, (6) a high-mol. non-crystallizable unsatd. fatty acid, (7) a lower fatty acid, probably butyric acid, and (8) a N-free residue. The pharmacol. activity of the poison is associated with this last-named substance. It can be prep'd. either as a neutral compd. difficultly sol. in water, probably as a cyclic acid anhydride, or as an acid form readily sol. in water, which shows the general properties of a saponin. The neutral form causes purulent inflammation and when dissolved in oil vesicle formation after subcutaneous injection; the acid form is actively hemolytic. G. H. SMITH.

Nitrogen-containing carbohydrate compounds of protein. O. SCHMIEDEBERG. *Arch. exp. Path. Pharm.* 87, 1-30 (1920).—From various proteins a compd. possessing the properties and characteristics of hyaloidin, as derived from the echinococcus, can be isolated. Preliminary treatment of the protein results in a mixt. of hyaloidin, mucoidin and melanoidin. The method of sepg. these three substances is given in detail. The hyaloidin from the echinococcus conformed to the formula $C_{16}H_{24}N_2O_9$, $C_{21}H_{34}N_2O_9$ or $C_{26}H_{46}N_2O_9$ in accordance with the amt. of water present; that obtained from ovarian fluid $C_{16}H_{24}N_2O_9 + \frac{1}{4}H_2O$; that from egg albumin $C_{16}H_{24}N_2O_9 + \frac{4}{5}H_2O$; that from fibrin $C_{16}H_{24}(C_2H_4O_2)N_2O_9 + 5H_2O$ (or $C_{16}H_{24}N_2O_9$). Much discussion of the probable structural formula is presented. G. H. SMITH

The carbohydrate radical of mucoid and mucin. O. SCHMIEDEBERG. *Arch. exp. Path. Pharm.* 87, 31-46 (1920).—The following materials contain hyaloidin ($C_{16}H_{24}N_2O_9$) in the percentages indicated: protomucoidin I, II, VI (Leathes), 96.15; protomucoidin III, IV, V (Leathes), 94.2; protomucoidin V (Leathes), 88.6; submaxillary mucin (Obolensky), 43.25; sputum mucin (Fr. Müller), 42; metalbumin (Haerlin), 32.3; albumin mucoid (Hammersten), 28.6; ovomucoid (Zanetti) and ovomucoid (Schmiedeberg), 26.5; ovomucoid (Osborne and Campbell), 24.47; seromucoid (Zanetti), 17.7. Hyaloidin is firmly bound to protein or to protein derivs. Four types of union are recognized: (a) in albumin, globulin, fibrin, whose hyaloidin content is unknown; (b) in mucin and mucoid, which are rich in hyaloidin; (c) in mucoidin; and (d) in protomucoidin. G. H. SMITH

The relation of hyaloidin to the formation of chondroitin-sulfuric acid, collagen and amyloid in the body. O. SCHMIEDEBERG. *Arch. exp. Path. Pharm.* 87, 47-73 (1920).—The possible origin of chondroitin- H_2SO_4 is discussed. Apparently the formation of chondroitin- H_2SO_4 in the body is dependent upon the formation of collagen, and the proteins which give rise to collagen contain hyaloidin. The view is expressed that chondroitin- H_2SO_4 arises as a by-product in the conversion of the protein into collagen, which explains the wide distribution of chondroitin- H_2SO_4 in

organs and tissues rich in collagen and in those with amyloid formation. That chondroitin- H_2SO_4 may arise from hyaloidin seems possible from the similarities in their chem. compn. The transformation of hyaloidin into chondroitin, as the S-free compd., can take place in a simple manner only if one assumes that the protein contains 2 mols. of hyaloidin (of the formula $C_{24}H_{40}N_2O_8$) united with each other through a hexose, and that the conversion liberates an aldose rather than an alc. G. H. SMITH

Enzymes. III. Invertase and other enzymes of germinated barley. D. MARSTRINI. *Atti r. accad. Lincei* 28, II, 500-11 (1919).—Invertase can be extd. from germinated barley dried at temps. below 40° by 0.003 mol. % acetic or hydrochloric acid, and is present, not only in the emulsion, but also in the filtrate of the ext. To obtain an active liquid, the extn. should last at least 6 hrs. at 30-35°; the enzyme acts best at about 50° and is destroyed at 55°. The activity of malt invertase is destroyed in 48 hrs. by 0.003 mol. % KOH. Germinated barley contains a catalase and an oxidase, but no maltase, lactase nor rennase; the ext. does, indeed, coagulate milk, but such coagulation is due to the acidity of the ext., as it is produced even after the latter has been boiled.

J. S. C. I.

B—METHODS

STANLEY R. BENEDICT

The technic of lactic acid estimation and the measurement of the maximal lactic acid production capacity of muscle. GENIA RIESENFELD. *Biochem. Z.* 109, 249-70 (1920).—Expts. are detailed showing that the shaking extn. of muscle with amyl ale. according to Ohison (C. A. 11, 460) is satisfactory in pure H_2O solns. for the detn. of lactic acid but is not so in protein-containing solns. The fluids to be extd. must be protein-free; this is best accomplished by pptn. with phosphotungstic acid. Satn. with $(NH_4)_2SO_4$ is of little practical value. A part of the lactic acid of the tissue remains therein even after heating of the coagulum. Nevertheless this amt. is so far below the usual limits of error of the method that it can be neglected in ordinary work. The approx. detn. of the max. lactic acid production capacity of a tissue is made by suspending the tissue pieces in physiol. $NaCl$ soln. for 3 days at body temp. for autolysis in the presence of toluene and $CHCl_3$. Autolysis in 2% $NaHCO_3$ retards lactic acid formation; nevertheless, the danger of a secondary destruction is lessened. There is no simple relation between the lactic acid production capacity of different tissues of the same individual and their total carbohydrate content. F. S. HAMMETT

The determination of the blood corpuscle volume. RICH. EGE. *Biochem. Z.* 109, 241-8 (1920).—A critical résumé of the various methods for the detn. of the red blood corpuscle vol. the conclusion of which is that the hematocrit method is to be preferred.

F. S. HAMMETT

Determination of copper, particularly with respect to sugar determinations (BRUHN'S) 7.

C—BACTERIOLOGY

A. K. BALLS

American progress in the bacteriological sugars. EDMUND H. EITEL. *J. Ind. Eng. Chem.* 12, 1202-5 (1920).—This paper gives a brief review of recent work on the production of rare sugars in this country. The following are now made on a commercial scale, in higher purity and at lower cost than those formerly imported: *l*-arabinose, dulcitol, *d*-galactose, *d*-glucose, glycogen, inositol, inulin, invert sugar, lactose, *d*-levulose, maltose, *d*-mannitol, *d*-mannose, melititose, raffinose, rhamnose, sorbitol, sucrose, trehalose and *l*-xylose. The uses of the rare sugars, esp. in bacteriology, are discussed; and a more extensive utilization in the future is predicted. The author emphasizes the importance of developing sugars fermented by specific organisms.

A. L. BARKER

D—BOTANY

C. L. ALSERG

The colloid chemistry of wood, its constituents, and its formation. H. WIS-LICENUS. *Kolloid-Z.* 27, 209-23 (1920).—Natural substances are composed of highly complex molecular groups, which are not crystallizable nor distillable, and exhibit only chemical inertness and colloid solubility. Their behavior is not to be explained from purely chemical considerations, which so far have shown the probability of the synthetic series $\text{CO}_2 \rightarrow$ formaldehyde \rightarrow sugars \rightarrow polysaccharides, and even how cellulose of unknown molecular size, vegetable acids, tannins, fats and resins may be formed from primary products of assimilation, but which fail to explain *lignification* of the cellulose framework. While the analysis of cellulose indicates that its constitution is constantly $(\text{C}_6\text{H}_{10}\text{O}_6)_n$, the analysis of "lignin" shows wide variations, *i. e.*, C = less than 52.5 to above 65.0; H = 5.3 to 4.8; O + N = 42.2 to 30.2. Though Klason has shown that some woods probably contain a condensation product of coniferyl alcohol and oxyconiferyl alcohol, this is not essentially the wood-forming substance. *Lignin* is composed of the sum total of colloidally dissolved hydrosols of high molecular weight which are deposited by adsorption from the formative or cambial sap upon surface of the cellulose fibers. In this manner proceed lignification, pith formation, and other heretofore obscure physiological phenomena such as annular rings and growth. While the structure-forming cellulose is constant, and the anatomical form does not vary much, there are wide differences in the properties of various woods consequent upon the variability of the lignin. The % of adsorbable material in *spring* or *running saps* (for method see *Kolloid-Z.* 2, 1908) was: birch, 3.53 in March to 8.4 in late April; sugar maple, 4.4; hornbeam, 21.06. In *cambial sap*: birch, 37.07 in late May to 19.55 in late July; pine, 31.1 in early July to 6.45 in early Aug.; mountain-ash, 24.19 in early July to 8.04 in early Aug.; hornbeam, 30.88 in late July. Thus maximum colloid content of the formative juices coincides with maximum lignification. The principal processes yielding adsorbable substances are probably the following: (1) Normal polymerization and addition by primary valences (*i. e.*, quinone and hydroquinol are hardly adsorbed by fibrous clay, but quinhydrone is strongly adsorbed); (2) formation of molecular complexes by satisfaction of residual valences (*i. e.*, pyrogalloquinone is powerfully adsorbed compared with quinone and *p*-trihydroxybenzene pyrogallol); (3) ordinary condensation (*i. e.*, phenol and formaldehyde not adsorbed, veranol strongly adsorbed); (4) autoxidation with subsequent condensation (*i. e.*, oxidation products of pyrogallol are strongly adsorbed); (5) other syntheses and transformations (tannin, a glucoside, is much more powerfully adsorbed than its probable constituents, gallic acid, glucose, pyrogallol). Pentose complexes (pentosans) play an important role in lignification, and can not be separated analytically from the hexose derivatives, of which the acme is the chemically inert cellulose, together with its allies, "hemicellulose," etc. A colloidal solution of cellulose may be produced by intensive grinding, but cannot equal natural dispersion. Profound development of surface can, however, be reached with the fibrous clay above referred to. Lignification depends mainly on adsorption, although this may be followed by chemical reaction, colloidal dehydration, toughening, "aging," and formation of complexes resembling cellulose in colloidal properties.

JEROME ALEXANDER

The reduction of nitric acid by green cells. OTTO WARBURG AND ERWIN NEGELIN. *Biochem. Z.* 110, 86-115 (1920).—Studies were made of the reduction by algae of dil. NaNO_3 and HNO_3 solns. by detns. of the CO_2 , NH_3 and residual HNO_3 . Extensive protocols are given, the results of which indicate that the O_2 consumption and the CO_2 production are both increased when the plants are placed in the nitrate soln. NH_3 is also formed as the sole reduction product of the HNO_3 . A theoretical discussion is given of the thermodynamics of the reaction.

F. S. HAMMETT

A method of studying the absorption-transpiration ratio in nutrient media. EARL S. JOHNSTON. *Science* 52, 517-8 (1920).—A 600-cc. bottle, through the stopper of which pass a thermometer, the plant, and a 2 cc. graduated pipet, is used to measure the absorption-transpiration ratio of plants growing in H_2O cultures. T. G. P.

Optimum nutrient solutions for plants. D. R. HOAGLAND. *Science* 52, 562-4 (1920).—H. concludes that if there is an optimum nutrient soln. for a given plant, it is not definite, but includes wide ranges of both total concn. and ion ratios. T. G. P.

Seasonal changes in the chemical composition of apple spurs. J. D. HOOKER, JR. Missouri Agr. Exp. Sta., *Research Bull.* 49, 51 pp. (1920).—Samples of apple spurs with leaves, flowers or fruit removed were collected at intervals during a year and their chem. compn. studied in relation to their physiol. condition. Three types were investigated: spurs that blossomed and bore fruit; spurs that did not blossom, but which developed fruit buds; and barren spurs that neither blossomed nor developed fruit buds. Detns. were made of the dry wt., ash, titratable acidity, K, P, total N, reducing and non-reducing sugars, starch, total polysaccharides and hydrogen-ion concn. The seasonal changes in most of the constituents examin. are distinct and characteristic of the condition of the spur, bearing, non-bearing, or barren. In general the bearing and sterile spurs show extreme values, while the non-bearing spurs assume a position intermediate between them. The conditions characteristic of bearing and non-bearing spurs of the same tree are practically identical with the conditions of spurs from different trees in bearing and in the off year respectively. Spurs from barren trees are characterized by a seasonal chem. picture distinctly different from the two types of spurs from productive trees. For most constituents, the spurs pass through one period of max. content and one of minimum content during the course of the year. In the cases of starch and titratable acidity there are 2 maxima and 2 minima, the maxima of one coming at approx. the same time as the minima of the other. Carbohydrate consumption and acidity seem to be correlated. Conditions leading to high starch and low N content at the time of fruit-bud differentiation appear to be essential for productivity. Fruit-bearing spurs that develop leaf buds have a low starch and high N content, and barren spurs have a low starch and low nitrogen content. The starch-nitrogen ratio is more indicative than the total carbohydrate-nitrogen ratio. During the late summer and fall there is a steady increase in the P and N contents of spurs with fruit buds. The absence of this feature in barren spurs suggests a necessity for P and N storage, making possible the marked increase in these elements that is peculiar to bearing spurs in the spring. Chem. analyses of the buds taken at different seasons are given in detail. J. J. SKINNER

Investigations in the ripening and storage of Bartlett pears. J. R. MAGNESS. *J. Agr. Research* 19, 473-500 (1920).—A distinct relationship was found between the total amt. of sugar present in the ripe pear and the temp. of storage at which it had been held from the time of removing from the tree, until ripe. Pears ripened at 70° F. contained the highest % of sugar, at 40° the lowest, and those held at 30° from 6-14 weeks and then ripened at room temp. were intermediate in amt. of total sugar. There was no marked relation between temp. of storage and relative amt. of sucrose and reducing sugars. There is a marked and uniform increase in total sugar in the pear from early summer until after the time of the close of the picking season. The increase in the latter part of the season is due mainly to an accumulation of sucrose, while the earlier increase is due mainly to reducing sugar. The percentage of titratable acid tended to decrease in the fruit from the California sections as the season advanced, while it tended to increase in fruit from Oregon and Washington. There was much less acid in fruit ripened at 40° than in that ripened at 70° and still less in fruit held at 30°. The acid content of fruit that was well matured on the tree remained nearly const. during storage. There was a progressive reduction in the alcohol-insol. acid-

hydrolyzable reducing material as the season advanced, in fresh picked fruit from the tree and in the same fruit after ripening. The % of total solids is lowest at about the opening of the commercial season. This tends to increase with the accumulation of sugar in the late-picked lots. A general discussion of results as applied to commercial handling is given.

J. J. SKINNER

Nutrient requirements of the potato plant grown in sand cultures treated with "type 1" solutions. EARL S. JOHNSTON. *Soil Science* 10, 389-409(1920).—Potato sprouts sep'd. from the seed pieces were grown in sand cultures treated with solns. of 21 different salt proportions of KH_2PO_4 , $\text{Ca}(\text{NO}_3)_2$, and MgSO_4 . The partial osmotic pressures varied by equal increments of $1/8$ of the total osmotic pressure which was 1 atm. The best growth occurred in cultures low in MgSO_4 and high in $\text{Ca}(\text{NO}_3)_2$, with medium KH_2PO_4 . The av. water requirement was 403 but no relation was evident between high yield and low water requirement or low yield and high water requirement.

W. J. ROBBINS

The relation of nitrates to nodule production. W. H. STROWD. *Soil Science* 10, 343-56(1920).—The concn. of NO_3 in the cell sap of the roots of soy bean is many times the concn. in the soil. The concn. is greater during periods of arrested photosynthesis. NO_3 retards and in sufficient quantities prevents nodule production on soy beans. The concn. of NO_3 in the plant sap when the plants fail to produce nodules is sufficient to prevent the growth of soy-bean bacteria in the soil. The failure of nodule production in the presence of NO_3 is due to the effect of high concn. of NO_3 in the sap upon the growth of *Rhizobium leguminosarum*.

W. J. ROBBINS

E—NUTRITION

PHILIP B. HAWK

NORMAL

Foods and races. J. S. LANKFORD. *N. Y. Med. J.* 112, 845-8(1920).—This is a well written article on the relation between the diet of a race and its physical and intellectual growth, in which the lack of advancement of the Japanese from 1723 to 1846 is attributed to a predominately vegetarian diet and their progress since that time to the admission of meat products to the diet. The emotionalism of the Latins is attributed to a high sugar intake.

F. S. HAMMETT

The chemical properties of food fats of different biological value. S. ROSENBAUM. *Biochem. Z.* 109, 271-8(1920).—The relative amts. of phosphatides and sterol in egg-yolk fat, cod-liver oil, butter fat, human milk fat, lard and hazel nut oil were detd. with a view to detg. the relation between their food and biological values. No quant. differences could be found in any case that could be correlated with the biological value. This signifies that the study of only the unsaponifiable part of a series of food fats cannot be used as a criterion of their biological value. F. S. HAMMETT

The influence of water-soluble vitamine on nutrition of dogs. W. G. KARR. Yale Univ. *Proc. Soc. Exp. Biol. Med.* 17, 84-5(1920).—Dogs were fed on a diet devoid of H_2O -sol. vitamine and consisting of lard, sucrose, inorg. salts, and protein in the form of casein or wheat gluten. It furnished 70-80 cals. per kg. body wt. After 3 to 9 wks. the dogs began to refuse part or all of their food. Characteristic polyneuritic symptoms were developed by some of the animals. Ingestion of 1 g. brewer's yeast, previously dried, caused quick recovery of appetite. Five g. of the dried yeast caused disappearance of polyneuritic symptoms in 8-12 hrs. and a quick recovery of the animal to its normal condition. Protein utilization was not affected by lack of H_2O -sol. vitamine. The fat-sol. vitamine is apparently of less importance than the H_2O -sol. in the nutrition of the adult dog.

V. C. MYERS

Studies in the absorption of fats. T. F. ZUCKER. Columbia Univ. *Proc. Soc. Exp. Biol. Med.* 17, 89-91(1920).—The general impression of workers in the field of

fat metabolism seems to be that while most of the fat enters the circulation by way of the thoracic duct, a smaller portion can be absorbed directly into the blood stream. Criticism is made here of the work of investigators in that exptl. conditions are far from normal, and in some cases analytical technic leaves much to be desired. Five expts. were carried out by Z., in which the jugular blood of dogs was analyzed before and 3 hrs. after the giving of 50 cc. of olive oil by stomach tube. Four hrs. after the oil was given the dog was stunned by a quick blow on the occiput, the abdomen was opened, and samples of portal and mesenteric blood taken. Then another sample of jugular blood was taken. Analysis was made for cholesterol, fatty acids and phosphatides by Bloor's procedures and for hemoglobin by the acid hematin method. Cholesterol remained const. Phosphatides were increased 36%, and fatty acids 49% by the administration of olive oil. There was no difference in these constituents between jugular, mesenteric, and portal blood. The data here presented preclude the assumption of any marked participation of the blood vessels in the absorption of fat, leaving open the question of absorption of small amts. beyond the detection of the methods used.

V. C. MYERS

Is unpalatable food properly digested? C. A. SMITH, R. C. HOLDER AND P. B. HAWK. Jefferson Med. Coll., Phila. *Proc. Soc. Exp. Biol. Med.* 17, 98-9 (1920).—Expts. were conducted to det. whether the return to the body from unpalatable food was different from the return from the same food palatably served. Two subjects were put on 7-day period of uniform diet, served attractively, followed by a 2-day period in which the same diet was fed in unpalatable condition, in dirty, unpleasant surroundings. Differences in utilization of food in the two periods, and variations in N retention were small. Utilization of N was 86.7% in the first period, and 85.7% in the last period, indicating that flavor is not outstanding in importance in food utilization.

V. C. MYERS

ABNORMAL

Decalcification due to nutritional disturbances (neurasthenia) as shown by the radiograph. H. DUFOUR. *Bull. mem. soc. med. hop. Par.* 36, 1261-2 (1920).—Assuming that urine analyses are of little worth in detg. a condition of decalcification in practical medicine, D. studied by X-ray the bones of patients suspected of Ca loss by comparing the pictures with those obtained from presumably normal individuals of the same height and flesh.

F. S. HAMMERT

F—PHYSIOLOGY

ANDREW HUNTER

Colloid studies of the red blood corpuscles and hemolysis. I. Sublimate fixation and sublimate hemolysis. H. BECHOLD AND W. KRAUS. *Biochem. Z.* 109, 226-35 (1920).—The reactions of a 5% suspension of sheep corpuscles in physiol. NaCl soln. to which were added various detd. amts. of $HgCl_2$ dissolved in physiol. NaCl were studied under the ultramicroscope immediately on the addition of the salt and after 24 hrs. immersion of the treated corpuscles in H_2O . Pictures are given. It is concluded that the $HgCl_2$ is sol. in the corpuscular surface since it penetrates the cell. There it produces various phenomena according to its concn. In the higher concns. the protein constituents are pptd. *in situ* in coarse structures in the irreversible pptn. zone. The boundary between this and the hemolytic zone is filled with fine flocculi in Brownian movement. The $HgCl_2$ does not ppt. the contents of the hemolytic zone. Hemolysis then occurs in 3 stages: the 1st is soln. of the $HgCl_2$ in the surface, the 2nd is the contraction of the membrane previously present or formed by action of the $HgCl_2$ on the inner side of the outer covering with a simultaneous more or less complete expression of the fluid contents, particularly the hemoglobin soln., and the 3rd stage is where the liberated fluid contents leaves the corpuscular disk through the outer surface injured by the formation and retraction of the inner sheath. II. Ultra-

microscopic studies on the stroma. ERNST SALÉN. *Ibid* 110, 176-80(1920).—Hemolyzed preps. of red blood corpuscles were treated with acetone, saponin, or alc. and the residuum was studied with the ultramicroscope. The results indicated that after soln. of the lipoid constituents of the stroma there remains a fine network; this residue is made more prominent by an acetic acid soln. of $K_4Fe(CN)_6$, the protein precipitant, and is completely digested by pepsin and trypsin. S. concludes that the residue in question is protein or nucleoprotein insol. in water and in physiol NaCl.

F. S. HAMMETT

The secretion of bile. I. ERNST NEUBAUER. *Biochem. Z.* 109, 82-102(1920).—Studies were made of the amts., sp. gr., surface tension, viscosity, reducing power and dry matter of bile produced under normal conditions and under the influence of pilocarpine, atropine and adrenine administration in rabbits. Under so-called normal conditions after the operation the amt. of bile secreted generally slows down during the 1st hour and a half to a level which shows periodic variations with a slight tendency to diminution. The sp. gr. of this bile is around 1.01 and slowly decreases during the progress of the expt. along with the total solid content, which at the beginning ranges between 2 and 2.5%. The surface tension in the different animals ranges from 617 to 631 and tends to increase during the period of observation. The viscosity lies around 103. Although the urine contains sugar at the end of the expt. the bile is sugar-free. When pilocarpine is injected the course of the bile secretion is as under normal conditions, though possibly to a lesser degree; the sp. gr. tends to increase as does the percent of dry matter, while the surface tension and viscosity are unchanged. No sugar is present in bile after the injection of pilocarpine. Atropine apparently causes no definite change in these factors when injected into rabbits. When adrenine, however, is administered the bile secretion sinks below that obtaining in the control animals, in fact with large doses secretion is stopped. The sp. gr. rises as does the percent of dry matter. The surface tension falls and the viscosity is often markedly increased. Subcutaneous adrenine injections always cause the appearance of sugar in the bile; this is rarely seen after intravenous injections. F. S. HAMMETT

Spleen and carbohydrate metabolism. T. TOGAWA. *Biochem. Z.* 109, 1-17 (1920).—Rabbits, frogs and guinea pigs were the exptl. animals. After removal of the spleen the fasting animals contained more glycogen than did the similarly treated unoperated controls although the blood sugar was the same both before and after operation. Ext. of the spleen causes a decrease in the liver glycogen, and a slight hyperglycemia but no glucosuria. The injection of spleen ext. tends to increase the adrenine hyperglycemia, but when the spleen is extirpated no disturbance of the adrenine hyperglycemia is produced. When fructose is injected intravenously into animals without spleens the resultant hyperglycemia is of a higher degree and lasts longer than in normal controls. When adrenine or strychnine is injected into such controls the loss of glycogen from the liver is greater than in animals from which the spleen has been removed when similarly treated. No changes were observed in the blood sugar concn. of normal animals when they were fed with desiccated spleen. It is concluded that the spleen plays a role in carbohydrate metabolism which warrants its placement with the other endocrine glands as a factor in the general system.

F. S. H.

Physico-chemical studies of the body fluids. I. The state of chlorine in serum and plasma. S. RUSNÝÁK. *Biochem. Z.* 110, 60-5(1920).—The statements of Falta and Richter-Quittner (C. A. 13, 2395) concerning the different behavior of serum and plasma in the detn. of Cl are correct. In fact serum gives the same Cl content when analyzed by the different methods, while in plasma variable results are obtained. These variations are attributed to the greater protein content of the plasma and not to combined Cl. This is shown by the fact that if the protein content of serum is in-

creased by ultrafiltration it, too, shows a variation in Cl content as detd. by different methods. R. considers that deproteinization by ultrafiltration is the method most free from error for obtaining a soln. for the detn. of Cl and that there is as yet no proof existent of the presence of colloidally bound Cl in blood. F. S. HAMMETT

Analyses of blood gases. V. The influence of the alkaline earth metals on hemoglobin and cell colloids. H. STRAUB AND K.L. MEIER. *Biochem. Z.* 109, 47-81 (1920); cf. *C. A.* 14, 1571.—The alk. earth metals as well as the alkali metals follow a specific law in their action on hemoglobin and the cell membrane. The action on both substances is practically the same but the nature of the action of all the 4 alk. earth metals tested is dependent upon the concn. used. Very dil. concns. are not active; when the threshold is passed hemolysis occurs at a lower acidity than when the alk. earth metal is not present. This is designated as principle "b." With rising doses the principle "a" comes into force at medium doses, in the sense, that an equil. obtains between the factors of the 2 principles, since hemolysis is gradually always more retarded with increasing concn. Curves and tables are given of the data and showing the points of upper and lower deviations obtained by Mg, Ca, Sr and Ba. The max. activity of the so-called "a" and "b" principles as demonstrated by the jumps in the curves is the same for all the alk. earth metals at the optimal concn. F. S. HAMMETT

The permeability of the blood corpuscles to glucose and anelectrolytes. RICH. EGE. *Biochem. Z.* 107, 246-7 (1920).—Polemical concerning the article by Falta and Richter-Quittner (*C. A.* 14, 2371). F. S. HAMMETT

Action of prostatic extracts on isolated genito-urinary organs. DAVID I. MACHT AND S. MATSUMOTO. Johns Hopkins Univ., and Brady Urol. Inst., Baltimore. *Proc. Soc. Exp. Biol. Med.* 17, 102-3 (1920).—Contractions and tonicity of various surviving excized genito-urinary organs were studied *in vitro*, after addition of aq. saline ext. of ram's, dog's, bull's, steer's or human prostatic glands. All the organs studied are stimulated *in vitro* by the exts., provided a sufficient dose is used, but different organs require different doses. Uterus and tubes respond to the least quantity of prostatic ext.; bladder and ureters come next in order of response; the vas deferens and seminal vesicles require the largest doses to produce effect. V. C. MYERS

Sugar and oxygen relationships in blood of dogs. E. L. SCOTT AND A. B. HASTINGS. Columbia Univ. *Proc. Soc. Exp. Biol. Med.* 17, 67-9 (1920).—Blood sugar was estd. by the MacLean method, O content and capacity of blood determined by Van Slyke technic. Blood was drawn without exposure to air, from external jugular vein of resting dogs at $1\frac{1}{2}$ to 2 hr. intervals for $7\frac{1}{2}$ hrs. About 10% of the total blood was removed before final sample taken. Slight decrease in O content and capacity and in sugar content of blood was found following hemorrhage of this extent. The av. level assumed by these factors seems to be relatively const. and characteristic for the individual, but widely varied in different individuals. A direct relationship was found to exist between the ratio of the O content to O capacity, *i. e.*, % satn., and the blood sugar. The sugar varies in opposite direction to the course it takes in asphyxial hyperglycemia. The relative vols. of corpuscles and serum were detd. in a few cases by a precision hematocrit. O content per unit vol. of corpuscles was found to bear a direct relationship to the blood sugar. The corpuscular vol. might be taken here as an index of the O capacity of blood. V. C. MYERS

Pituitary feeding and egg production in the domestic fowl. S. SIMPSON. Cornell Univ. *Proc. Soc. Exp. Biol. Med.* 17, 87-8 (1920).—Clark found that egg production of chickens was markedly increased by feeding dried pituitary in amts. equal to 20 mg. fresh gland to each hen per day. The glandular material used was from young growing animals, calves and lambs. No increase in egg production from pituitary feeding was observed by S. He repeated the expts. of C. at different seasons of the yr., with

adult gland of ox, and with that of calf, with doses equal to that fed by C., and later with 2 and 3 times the dose, without any distinct effect. Simple-comb white leghorns were used by both investigators.

V. C. MYERS

Relation between viscosity of blood and its content in erythrocytes and dissolved protein. MAX E. BIRCHER. *Arch. ges. Physiol.* 182, 1-27(1920).—The curve plotted in accordance with the viscosity of successive dilns. of serum only approximates that representing the actual amt. of protein in the serum. Measurements are made correlating the no. of erythrocytes and the viscosity and the vol. of erythrocytes and the serum viscosity. A method based on such data is suggested for measuring the total vol. of erythrocytes in the blood.

G. H. SMITH

Chlorine interchange between red blood cells and the surrounding fluid. R. SIGBECK. *Arch. exp. Path. Pharm.* 85, 214-26(1920).—The total amt. of Cl in the blood may vary under different conditions but the ratio of Cl in the erythrocytes to that in the serum remains relatively const.; av. 1:2. This ratio holds for normal as well as for a variety of pathol. conditions. When Na_2SO_4 or sucrose is added to serum the ratio changes, some of the Cl leaving the cells. After standing for a time the normal ratio is restored.

G. H. SMITH

G—PATHOLOGY

H. GIDEON WELLS

Stalagmometric investigations on urines and their use in clinical pathology. W. SCHEMENSKY. Inst. f. Kolloidforschung and Univ. Frankfurt a. M. *Münch. med. Wochschr.* 67, 773-5(1920).—The urines are dild. to a d. of 1.010 and HCl is added to a H-ion concn. of 10^{-6} - 10^{-8} (methyl orange from yellow to orange, Congo red to light blue). Substances influencing the surface tension are absorbable and can be removed by animal charcoal. The urine is shaken with a 10% suspension 10 minutes. Of the stalagmometric quotients, the "quotient" is the number of drops of urine of d. 1.010 divided by the number of drops of urine after treatment with animal charcoal. The "acid quotient" is the number of drops of urine after addition of HCl divided by the number of drops of this urine after treatment with animal charcoal. In stating the quotients the cipher to the left of the period is omitted and three decimals to the right are taken, for instance 1.071 means a quotient of 71; one of 1.182 means 182. Normally the quotient was 19-101, the acid quotient 82-288. As a rule the acid quotient remains below 200, the quotient much below 100. Of 14 urines with bile pigments 4 gave normal quotients, 10 exceeded 100. But the acid quotients were always high, 272-465. Results are given for nephritic urines. Increasing amts. of albumin and albumoses increase the stalagmometric quotients, but the figures are higher than can be accounted for in this way. In pyelitis of pyelonephritis and one case of cystitis the quotients were increased as well as in pregnancy.

S. AMBERG

Treatment of surgical tuberculosis cases with the Friedmann remedy and the results after six years. F. KRUMM. *Münch. med. Wochschr.* 67, 870-2(1920).—Modification of the condemnation of the Friedmann method in 1914. There seem to be late beneficial results in certain cases.

S. AMBERG

A serum against soft chancre, particularly its hubo (preliminary report). J. REGNSTIERNA. Stockholm. *Münch. med. Wochschr.* 67, 895-6(1920).—A serum was obtained from sheep treated with the streptobacillus Ducrey-Krefting-Unna, the cause of soft chancre. The serum gives complement fixation. Killed bacteria are added to produce fever on injection, which is given into the gluteal muscles. The effect on ulcerus molle and hubo is very marked.

S. AMBERG

The rapidity of sedimentation of the red blood corpuscles in normal and in insane individuals (preliminary report). W. RUNGE. Univ. Kiel. *Münch. med. Wochschr.* 67, 953-5(1920).—Blood is put in a tube with sodium citrate soln. and the time it takes

the red blood corpuscles to sink to various levels is noted. The red blood corpuscles of women settle faster than those of men. In some cases of catatonia the sedimentation proceeds with greater rapidity and particularly in cases of paralysis. In some cases of dementia precoox this happened also, as well as in other diseases, such as arteriosclerosis, encephalitis lethargica, etc.

S. AMBERG

Serologic studies with regard to the problem of paralysis. V. KAFKA. Univ. Hamburg. *Münch. med. Wochschr.* 67, 955-7 (1920).—To be published *in extenso* elsewhere.

S. AMBERG

The mechanism of the Sachs-Georgi reaction. M. MANDELBAUM. *Münch. med. Wochschr.* 67, 982 (1920).—There is no parallelism of the globulin content of sera with regard to the Wassermann and Sachs-Georgi reactions. Some exptl. results are given but these are to be published more fully elsewhere.

S. AMBERG

Change of resistance and functional increase of cellular activity in its significance for infection and neoplasm. P. LINDIG. Univ. Freiberg i. Br. *Münch. med. Wochschr.* 67, 982-3 (1920).—The experimental results are to be published elsewhere. General considerations, starting from the fact that the blood of the new-horn has a high caseolytic titer and is resistant to various infections.

S. AMBERG

The laws of activation through dilution and decomposition, at the same time a more profound understanding of the vaccine therapy. H. MÜCH. Univ. Ifamburg. *Münch. med. Wochschr.* 67, 1005-6 (1920).—General, partly grotesque considerations.

S. AMBERG

Cholesterol content of human bile. MARGOT NATHAN. Giessen. *Arch. path. Anat. (Virchow's)* 228, 51-67 (1920).—Bile was obtained from drainage tubes of 5 patients who had been operated upon for gall stones. The cholesterol content drops during the first 2 days after operation, it begins to rise on the 3rd day and following this reaches a const. level remaining between 0.045-0.055%.

E. B. FINK

The hypophysis in diabetes mellitus. ERIK JOHANNES KRAUS. Prague. *Arch. path. Anat. (Virchow's)* 228, 68-133 (1920).—In a number of cases of diabetes characteristic histological changes were found in the anterior lobe of the hypophysis. In 2 cases the anterior lobe was distinctly smaller than normal, poor in eosinophile cells and those present were small, of abnormal form and arrangement, showed nuclear changes in the form of pycnosis and a scattering of the eosinophile and chief cells. These changes are due to an interference with the formation of eosinophile cells and the degenerative changes are due to the toxic effect of diabetes. These changes are sp. In a large % of the hypophyses of young diabetics the cells were of fetal type and accompanied by areas of atrophy referable to vascular degeneration. On the basis of numerous animal expts. and histological studies in man it may be stated that the anterior lobe of the hypophysis, particularly the eosinophile cells, exerts a regulatory function upon carbohydrate metabolism. Increase in eosinophile cells (hyperfunction) reduces carbohydrate tolerance, while a reduction (hypofunction) increases tolerance.

E. B. FINK

Genital dystrophy and its relation to disturbance of hypophyseal function. W. BERLINGER. Kiel. *Arch. path. Anat. (Virchow's)* 228, 151-86 (1920).—Atrophy of the testes occurs in certain types of hypofunction of the anterior lobe of the hypophysis.

E. B. FINK

Postmortem autolysis of cell granules. OKA. FREIBURG. *Arch. path. Anat. (Virchow's)* 228, 200-15 (1920).—The more highly differentiated parenchyma cells are less resistant to autolysis than the interstitial substance. Liver cells and kidney epithelium lose their nuclei early, while connective tissue cells, particularly Glisson's capsule, retain their nuclei for a relatively long time. The clasmacytes are also somewhat resistant. In autolysis, the state of digestion of the animal at the time of death is an important factor. Autolysis of nuclear substances is influenced by temp.

and occurs best at body temp., indicating that the ferment concerned are similar to those in the action of complement on hemolytic amboceptor. The addition of salt solt. retards autolysis. The carmine granules are much more resistant than the Alt-mann granules. The pigment granules present in liver cells behave like the carmine granules. It is extremely difficult to det. the exact relationship between the carmine granules and mitochondria.

E. B. FINK

Pathological melanin with remarks upon normal liver pigment. E. SALKOWSKI. Berlin. *Arch. path. Anat. (Virchow's)* 228, 468-75(1920); cf. *C. A.* 14, 972.—The final purification of melanin may be carried out with acid-alc. as well as glacial acetic acid. Melanin contains organically bound P. The function of the cell nucleus in the production of melanin is concerned with the P fraction. Melanin is not closely related to the proteins since it contains neither the phenyl groups nor tryptophan and upon oxidation yields fatty acids of the series $C_6H_5O_2$. Oxidation expts. do not demonstrate the presence of hydroxyphenyl groups. The normal liver contains several pigments; the pigment obtained by treating the liver according to the method of isolation of pathol. melanin is not melanin.

E. B. FINK

Physiology and pathology of acid secretion by the stomach mucosa. R. ROSEN-MANN. Munster. *Arch. path. Anat. (Virchow's)* 229, 67-89(1920).—There are 2 stages in the secretion of acid by the stomach, the accumulation of Cl, and the formation of acid. Cl accumulation occurs during the resting stage as well as during active secretion of the stomach mucosa, until the max. Cl content of the gland cells is reached, which in turn is dependent upon the osmotic pressure of the blood. The formation of acid varies with the degree of digestion; during intensive digestion almost the entire quantity of stored Cl is excreted into the stomach in the form of HCl. A hyperacidity in the sense of a secretion containing a higher HCl content than 0.55-0.60% does not exist. In hypo- and anacidity the diseased glands secrete a gastric juice containing less acid than normal; the injection of alkalies does not appreciably influence the amt. of HCl in the secretion. It is possible that during reduced gastric secretion the gastric glands may secrete other acids than HCl (lactic and phosphoric) into the gastric juice.

E. B. FINK

Experiments upon the production of antihuman hemolysin with special reference to immunization with erythrocytes sensitized with heated serum. MOTOMATSU MATSUMOTO. Univ. of Penna. *J. Immunol.* 5, 507-16(1920).—The high mortality among rabbits immunized with human erythrocytes is probably due to direct toxicity of the cells and agglutination and hemolysis *in vivo*, rather than anaphylaxis. The stromata of human corpuscles may prove fatal for rabbits when injected intravenously, probably by agglutination *in vivo*. Solns. of human erythrocytes distd. in H₂O largely free of shadow corpuscles are much less toxic and better borne by rabbits than suspensions of whole cells; these solns. produce much less hemagglutinin and slightly less hemolysin than whole cells, but may prove preferable to the latter for the immunization of rabbits for the prepn. of hemolysin.

E. B. FINK

A note on the non-specific production of antibodies. MOTOMATSU MATSUMOTO. *J. Immunol.* 5, 517-9(1920).—The immunization of rabbits with washed human and sheep corpuscles results only in the production of sp. agglutinins and hemolysins for human and sheep corpuscles respectively. Occasionally rabbits showed an apparent slight increase of non-sp. hemolysin or agglutinin, but these were so slight as to be explained by the normal variation of natural antibodies or exptl. error.

E. B. FINK

The Sachs-Georgi precipitation test for syphilis. THOMAS G. HULL AND EVA E. FAUGER. Ill. Dept. of Health. *J. Immunol.* 5, 521-7(1920).—A modification of the Sachs-Georgi pptn. test for syphilis is described, using clear blood serum and an alc. ext. of beef heart, either cholesterolized or not. The pptn. test agreed with the Wassermann test in 88% of the cases; in 7% it was more delicate, giving positive results

where the Wassermann was negative; in 3% it was negative where the Wassermann was doubtful; in 2% it was negative where the Wasserman was positive. Treatment of the patient apparently affects the results of pptn. causing it at times to become negative while the Wassermann is still positive. Attempts to det. whether the ppt. formed in the test was responsible for the Wassermann reaction were unsuccessful.

E. B. FINK

A study of the mechanism of human isohemagglutination. HERBERT L. KORCKERT. Western Reserve Univ., Cleveland. *J. Immunol.* 5, 529-37(1920).—By what may be designated the fractional absorption of agglutinins from so-called polyclonal serums and the fractional satn. or combination of receptors of polyvalent cells, it can be shown that there are 2 distinct normal human isohemagglutinins and 2 agglutinogens, which operate to produce the group distribution of human bloods. These agglutinins can be isolated by the method of fractional absorption. Isohemagglutinins may be recovered from agglutinated corpuscles but not completely. The agglutinins in fresh normal serums are sp. for particular agglutinogens or receptors.

E. B. FINK

A study of the specificity of the absorption of anti-bacterial precipitins. CHARLES KRUMWIEDE AND GEORGIA M. COOPER. Dept. of Health, N. Y. City. *J. Immunol.* 5, 547-62(1920).—A precipitin absorption method has only a limited application in the differentiation of closely related types of bacteria which, because of such relationship, show marked cross-pptn. The tendency in such cases is toward non-sp. results. Where the cross-pptn. is less marked, more sp. results tend to appear after precipitin absorption. The results are the same whether a precipitin antigen or the bacteria themselves are used for absorption. The results may be influenced by lack of a suitable method for the standardization of precipitin antigens of bacterial origin. The non-sp. results obtainable may be referable to the narrow working range of pptg. sera. The inadequacy of the precipitin reaction as a primary or single method of differentiation between related bacteria, which are serologically still unclassified, is again emphasized. While similar features in differentiation may occur with the agglutination reaction, such failures may be easily corrected by resorting to the absorption method.

E. B. FINK

The determination of the basal metabolism rate and its value in diseases of the thyroid gland. C. M. WILSON AND DOROTHY WILSON. London. *Lancet* 1920, II, 1042-5.—Dets. of basal metabolism rates have been found amply to justify the time spent in cases of impairment of function of the thyroid gland. They mark off toxic from non-toxic goiter, establish or refute suspicions of hypo- or hyperthyroidism, and furnish a graphic record of the results that follow the treatment of these conditions, so that selection of the line of treatment comes to rest upon exact methods. Moreover, observations suggest that these dets. will be found to have an altogether wider and more important application in general metabolic disorders, particularly where the balance of function between the different glands of internal secretion is impaired.

E. B. FINK

Albuminuria among soldiers on active service. W. JACOB. Jena. *Z. exp. Med.* 10, 211-22(1919).—In many of these cases there was a venous hyperemia as a result of vasoconstriction of the capillaries of the skin and venous stasis. This would place them in the same class as the albuminurias due to passive congestion of the kidneys as seen in cardiac decompensation. Whether such a condition predisposes these individuals to bacterial infection of the kidneys remains an open question.

E. B. F.

Studies on blood platelets. II. RUDOLPH DEGWITZ. Munich. *Z. exp. Med.* 11, 144-55(1920).—When guinea pigs are injected parenterally with a foreign non-toxic protein there is a diminution in the platelets similar to that following an acute infectious disease or the parenteral injection of a dead bacterial antigen. Following the injection of a homologous body or species protein there is no platelet reaction

just as after the injection of the non-antigen protein colloids, glue and gelatin. During the height of antibody production the injection of antigen, which in a normal animal would lead to a marked reaction, produces no effect upon the blood platelets. Passively immunized animals do not give the platelet reaction as long as the immunity lasts. No drop in platelets was observed in guinea pigs during anaphylaxis. The injection of protein products as low as tripeptides produces the same platelet reaction as the parenteral injection of antigens. Parenteral injection of dipeptides and amino acids produces no platelet reaction. Protein products which are of themselves not antigenic but produce a platelet reaction, when injected at 6-8-day intervals produce changes in the platelets after each injection even though no antibodies are formed. The changes in blood platelets following injections of tuberculin in normal and tuberculous guinea pigs and human beings on the one hand and individuals and animals injected with tuberculous material is not the same. Collodion sacs containing living tubercle bacilli or tuberculin when placed beneath the skin of healthy guinea pigs causes their platelets to react like those of tuberculous pigs to tuberculin injection after 72 hrs., while 24 hrs. after removal of the sacs they again react as normal pigs. Parenteral injections of carbohydrates and fats produce no decrease in platelets.

E. B. FINK

The cause of anaphylactic shock. J. FORSSMAN. *Biochem. Z.* 110, 133-63 (1920).—An extensive critical study of anaphylactic shock is described, together with expts. on injections of sheep corpuscle hemolyzing sera directly into the tissue substance of various organs and directly into the vessels leading to the organs, compared with intravenous administration and injections into the aorta. Finally the influence of the removal of various organs on the retardation of shock was tested. Direct tissue or intravenous injections failed to produce anaphylactic shock in all but 1 case. Narcosis has no significance in the final result when the serum injection is made some hrs. after extirpation of the organ. The observations made after the removal of the kidneys, the spleen, intestine, liver or adrenals show that these abdominal organs, in spite of their large antigen content, have no effect on the shock produced by the simple intravenous lethal dose. It was also found that the brain and its vessels have no primary significance in anaphylactic shock. In fact, the toxic serum in its passage through the brain is so weakened that the intracarotid injection of an acute lethal dose of serum as it returns through the head veins is no longer in condition to produce shock. When serum injections are made into the left ventricle anaphylaxis occurs, as it does after serum injections into the jugular vein. From these observations F. comes to the conclusion that anaphylactic shock after the simple intravenous injection of an acute lethal serum dose, takes its origin from the effect on either the coronary or bronchial arteries. It should be noted that the liver can detoxicate the serum as well as can the brain, and that after the removal of the kidneys the animal becomes insensitive to the ordinary lethal dose.

F. S. HAMMETT

A new picture of disturbance after serum injections. J. FORSSMAN. *Biochem. Z.* 110, 164-75 (1920).—When serum capable of producing anaphylactic shock in guinea pigs is injected into the carotid artery centralwards, it produces death in much smaller amts. than when injected intravenously, and is accompanied by disturbances of equil. strabismus, and exophthalmia, without the customary symptoms of anaphylaxis. This reaction is strengthened by adrenine.

F. S. HAMMETT

Changes in the cerebrospinal fluid in the paralyses of diphtheria. DE LAVERGNE. *Bull. mem. soc. med. hop. Paris* 36, 1246-50 (1920).—The paralyses of diphtheria are accompanied by a meningeal reaction which is characterized by an increased sugar and a cell-protein disintegration. It is probable that this condition occurs slightly before the appearance of the paralysis, the first sign of which is the increased sugar.

F. S. HAMMETT

The precipitation reaction of colloidal benzoin with the cerebrospinal fluid of neurosyphilites. G. GUILLAIN, G. LAROCHE AND P. LECHELLE. *Bull. mem. soc. med. hop. Paris* 36, 1299-1303 (1920).—Owing to the difficulty of prep. colloidal Au for the testing of the cerebrospinal fluid the authors have developed and adopted a method using colloidal benzoin. The method is less complicated than that in which colloidal Au is used. Six hemolysis tubes and 2 pipets graduated in 0.1 cc. are necessary. Two solns. are used—(1) a soln. of 0.1 g. c. p. NaCl in 1 l. distd. water, (2) the soln. of colloidal benzoin, prep'd. by dissolving 1 g. benzoin resin in 10 cc. abs. alc., allowing the mixt. to stand for 48 hrs. and decanting and using only the limpid liquid thus obtained. 0.3 cc. of this soln. is slowly dropped into 20 cc. of distd. water at 35° with stirring. This soln. must be freshly prep'd. The 6 tubes are placed in a rack; in the 1st 0.25 cc. of the NaCl soln. is placed; in the 2nd, 0.5 cc.; in the 3rd, 1.5 cc.; and in the 4th, 5th and 6th, 1 cc. of the same soln. 0.75 cc. of the cerebrospinal fluid to be tested is put into the 1st tube and 0.5 cc. in the 2nd and 3rd tubes. All are mixed carefully by aspirating with the pipet. One cc. from tube 3 is transferred to tube 4, mixed and 1 cc. from tube 4 is then placed in tube 5 and mixed; from tube 5, 1 cc. is taken and discarded, tube 6 remaining as control. The respective dilns. are hence $1/4$, $1/2$, $1/4$, $1/4$, $1/16$, 0. One cc. of the colloidal benzoin is then added to each tube and the reaction allowed to take place at room temp. (all traces of blood must be absent from the fluid to be tested). It is complete in 12 to 24 hrs. When the test is positive the pptn. of the benzoin is complete and the supernatant fluid is clear. The reaction is not in harmony with either the albumin or cell content of the cerebrospinal fluid.

F. S. HAMMETT

Two cases of hirsutism and virilism with psychopathy. LAIGNEL-LAVOASTINE AND A. BONTET. *Bull. mem. soc. med. hop. Paris* 36, 1303-13 (1920).—Two females diagnosed as endocrine dysharmonies due to ovarian disturbances were found to have hypercholesterolemia.

F. S. HAMMETT

Increased albumin and sugar in the cerebrospinal fluid of a certain number of cases of motor or convulsive disturbance. A. ROUGNER. *Bull. mem. soc. med. hop. Paris* 36, 1375-9 (1920).—The occurrence of increased albumin and sugar in these non-syphilitic types is confirmed and the suggestion is made that this increased concn. is the cause rather than the effect of the disturbances.

F. S. HAMMETT

Pellagra. E. J. WOOD. *Edinburgh Med. J.* 25, 363-74 (1920).—A clinical case report and brief review.

F. S. HAMMETT

An undescribed condition of infancy and its treatment. G. H. CLARK. *Glasgow Med. J.* (N. S.) 12, 193-202 (1920).—A description is given with pictures of 2 infants showing symptoms of idiocy, depression, fibrillary muscular twitchings, jerking movements of the limbs, convulsions and inability to balance. Since these symptoms simulate those occurring in parathyroidectomized animals, the children were fed upon 0.5 gr. thyroid tablets containing parathyroid substance as impurity. Improvement was marked.

F. S. HAMMETT

Cholesterol thorax. J. H. BARACH. *N. Y. Med. J.* 112, 811-2 (1920).—A case of right apical pneumonia complicated by pneumohydrothorax is reported. Aspiration of the fluid was made and examn. showed cholesterol crystals. No other test save the microscopic is reported for this unusual constituent of pleural effusions.

F. S. HAMMETT

The parathyroid and convulsive states. S. E. JELLIFFE. *N. Y. Med. J.* 112, 877-9 (1920).—An argument concerning the relation between tetany, parathyroid dysfunction and Ca metabolism disturbances.

F. S. HAMMETT

Hemostatic agents and the spontaneous changes in coagulation time following hemorrhage. P. J. HANZLIK. Western Reserve Univ. *J. Lab. Clin. Med.* 6, 59-61 (1920); cf. *C. A.* 14, 1161.—Further details of H.'s previous expts. are given. Etherized

dogs were used. Blood was withdrawn from the femoral, in amts. of 1-4 cc. for detn. of the coagulation time, complete invertibility being the standard end point. H. found like most other investigators that repeated hemorrhage, even in such small amts., materially hastened coagulation. Therefore, any method of studying hemostatic agents, involving repeated withdrawal of blood, is unreliable. E. R. LONG

Blood changes in a case of hemophilia after transfusion. HAROLD A. BULGER. Peter Bent Brigham Hospital, Boston. *J. Lab. Clin. Med.* 6, 102-4(1920).—A 14-year-old boy, with a family history of hemophilia, who was subject to hematuria and arthritis, and had bled profusely on extn. of a tooth, was transfused with 300 cc. of his mother's blood. Coagulation time dropped from 80 to 15 min. the day after transfusion and then gradually increased to 35 min. in the course of a month. Prothrombin time also gradually lengthened. The addition of thromboplastin, however, caused the oxalated plasma to coagulate as well as controls (Howell's method). This suggests thromboplastin deficiency as causal in the hemophilia. E. R. LONG

Relation of portal blood to liver maintenance. P. ROUS AND LOUISE D. LARIMORE. Rockefeller Inst. Med. Research. *Proc. Soc. Exp. Biol. Med.* 17, 65-6(1920).—Occlusion of portal branches to portion of rabbit liver leads to atrophy of parenchyma in the region deprived of portal blood and to hypertrophy of hepatic tissue elsewhere, which receives excess blood. Atrophy is simple, without degenerative changes or connective tissue replacement. It fails to progress when bile duct from proliferating liver tissue is ligated and hypertrophy checked. These facts hold for dog, though changes are slower in canine liver. Atrophy fails to occur in absence of compensating parenchyma, as when the portal stream is completely diverted from the whole liver by way of an Eck fistula. Bile secreted from a portion of rabbit liver far advanced in such atrophy is almost colorless and may give but a weak Pettenkofer reaction. Glycogen is present in atrophic cells in about the same amount as in hypertropic cells of the same animal. V. C. MYERS

Isoagglutinins and isohemolysins of the rat. G. L. RONDENBURG. Columbia Univ. *Proc. Soc. Exp. Biol. Med.* 17, 82(1920).—Possibility of correlation between irregularities in immunity against transplanted tumors, and isoagglutinins or isohemolysins of hosts prompted the study of these substances in the blood of rats. One group of rats, pure white, was resistant to growth of Jensen rat sarcoma; a 2nd group, red and white in color, was resistant to growth of Flexner-Jobling rat carcinoma; a 3rd group, banded black and white, was equally susceptible to both tumor strains. Cells and serum of different animals were tested against each other. Tests between animals of the same or different strain showed that neither agglutinins nor hemolysins were demonstrable, this being contrary to the phenomena in man, where 4 distinct groups have been found. V. C. MYERS

Latent infection in experimental spirochetosis. J. L. TODD. McGill Univ., Montreal. *Proc. Soc. Exp. Biol. Med.* 17, 83-4(1920).—It has been suggested that an immunity may be maintained by persistent latent infection. A study was made of immunity to *Spirocheta recurrentis* in white rats, by examn. for spirochetes all animals showing resistance to infection. Blood was examd. in thick stained films, and often spirochetes were found, on 1 or 2 days, after they had been absent for from 10 to 15 days. It often happens that normal infection follows when a rat is inoculated with blood from an animal, once infected, although repeated exams. have failed to show spirochetes in it. Inoculation of material in which living spirochetes have been seen sometimes fails to infect 1 of 2 rats inoculated at same time; sometimes infection produced remains unseen by microscopical examn. and is only detected by killing animal and subinoculating another rat with blood from it. Results are more successful in producing obvious infection when considerable quantities of blood are inoculated. Under CHCl_3 , it is easy to aspirate from 1 to 2.5 cc. blood from heart of adult rat without

injury to animal. By so doing, spirochetes were shown to be present in an apparently immune rat 32 days after parasites were last seen in blood films. V. C. M.

Simple and inoffensive procedure for avoiding anaphylactic shock. AUGUSTE LUMIÈRE AND JEAN CHEVROTIER. *Compt. rend.* 171, 741-3 (1920); cf. Kopaczewski and Vahram, also Richter, *et al.*, *C. A.* 14, 569.—A systematic series of expts. was made with various compds. capable of restraining the flocculation of colloids. Sheep serum was injected into a jack in small repeated doses, then 40 days after the last injection the jack was bled and the serum placed in a series of tubes. To these was added sheep serum containing the compd. to be tested. NaCNS , $\text{C}_2\text{H}_5\text{NaSO}_4$ and $\text{Na}_2\text{S}_2\text{O}_4$ were found most efficient but none of these wholly prevented pptn. $\text{Na}_2\text{S}_2\text{O}_4$ was greatly superior to NaCl , and because of its comparatively harmless properties is recommended for use in preventing the anaphylactic shock. L. W. RIGGS

Phenol and indican excretion in a case of tetany of intestinal origin. G. E. SIMPSON. Montreal. *J. Am. Med. Assoc.* 75, 1204 (1920).—On admission to the hospital the patient, whose previous diet contained an unregulated amt. of protein, showed very high indican excretion, but the phenol was not above normal. On a low protein diet the indican disappeared within 3 days. When the low level of indican excretion was established, meat was fed for a day or two and the indican excretion was enormously increased, the phenol was increased for a day. The indican gradually disappeared again on resuming a cereal and milk diet. During the period of regulated protein intake the spasms decreased in severity and finally disappeared. L. W. R.

Blood alkali reserve with experimental infections—preliminary report. E. F. HIRSCH. Chicago. *J. Am. Med. Assoc.* 75, 1204-5 (1920).—The blood alkali reserve of rabbits injected with bacteria is lowered coincidently with the initial leucopenia, and during the subsequent increase of the leucocytes rises to, or exceeds the level detd. originally for the animal. These changes occur within relatively short-timed intervals. Graphs of these reactions resemble in contour those generally known for immune body production. L. W. RIGGS

Further studies on the specificity of streptococci. RUTH TUNNICLIFF. *J. Am. Med. Assoc.* 75, 1339-40 (1920).—I. *Specific protective action of serum against hemolytic streptococcus of scarlet fever:* Exptl. tests showed that the serum of a sheep immunized with hemolytic streptococci from the throat in the acute stage of scarlet fever protected mice against cultures of hemolytic streptococci isolated from scarlet fever patients, but not against streptococci from other sources such as erysipelas, mastoiditis and influenza. This antistreptococcus serum rapidly lost its opsonic and protective power, which was restored by the addition of fresh normal sheep serum. These expts., together with the opsonin and agglutinin reactions, give additional weight to the conclusion that the hemolytic streptococci from the acute stage of scarlet fever form a distinct biologic group, apparently peculiar to scarlet fever. II. *Immunologic study of hemolytic streptococci of erysipelas:* In this case the serum of the immunized sheep contained opsonins and agglutinins for the hemolytic streptococci of this disease, but not for hemolytic streptococci from other sources. It is therefore concluded that the hemolytic streptococci of erysipelas belong to a distinct immunologic group, as detd. by opsonification and agglutination. L. W. RIGGS

Blood concentration changes in influenza. F. P. UNDERHILL AND M. RINGER. *J. Am. Med. Assoc.* 75, 1531-4 (1920).—The results of a study of over 40 cases are shown in 8 charts of curves. The following summary is given: Pathologically influenza and acute phosgene poisoning present strikingly similar effects on the respiratory tissue. In each pulmonary edema is a prominent feature. In acute COCl_2 poisoning, death is due to change in concn. of the blood. Extreme concn. of blood is incompatible with life. In influenza, the blood becomes greatly concd., a factor of greatest importance in the fatal outcome. A method of treatment evolved for acute

COCl_2 poisoning has been applied with success in a few cases of influenza. It consists in the maintenance, under carefully controlled conditions, of blood concn. as near the normal level as possible by venesection and fluid introduction. Changes in blood concn. in influenza, followed by hemoglobin estns., allow the grouping of cases into those demanding the prescribed treatment immediately, and those that do not need this type of treatment at once or do not need it at all. By following blood concn. changes, prognostication is greatly aided.

L. W. RIGGS

Alkali reserve in epidemic influenza and bronchopneumonia. D. S. HACHEN AND R. ISAACS. Cincinnati. *J. Am. Med. Assoc.* 75, 1624-6 (1920).—The following summary is given from a study of 20 cases: These diseases are accompanied by a depletion in the blood alkali reserve, which may be gradual or rapid and is not much influenced by moderate doses of alkali by the mouth. An alkali reserve of 46 or below (in spite of moderate alkali therapy by mouth) was found in conditions in which the prognosis was bad; from 46 to 52 in doubtful cases, and 53 or above when the prognosis was good. The alkali reserve does not give a clue to the occurrence of complications. The blood sugar is not markedly influenced by the variation in the clinical course of the disease. There is no definite relation between the amt. of cyanosis and the alkali reserve.

L. W. RIGGS

The pathochemistry of the residual nitrogen in kidney diseases. MAX ROSENBERG. *Arch. exp. Path. Pharm.* 87, 86-113 (1920); cf. *C. A.* 14, 2657.—Study of N retention was made to gain a better understanding of the N metabolism in certain types of diseases of the kidney. A proper understanding of the situation in such conditions can not be derived solely from data regarding the N balance, since 3 other factors appear to play a greater or less significant role in different disturbances. These 3 factors are (1) protein decompn. into toxic products, (2) the utilization of protein residues in the formation of intermediary N-containing compds., (3) the removal of the retention material from the blood by the tissues or the reverse. In the purely mechanical anuria of the essentially intact kidney the 1st and 2nd factors do not appear to be involved; in sublimate anuria and after complete nephrectomy the 1st factor is considerable; in nephritis characterized by hypoazoturia all 3 factors are of great importance. Because of the varied distribution of the retention materials in the blood and in tissues in different manifestations of azotemia, simple estn. of blood retention does not furnish an exact measure of the total retention, although within certain limits the one will parallel the other. The formula of Weill for the detn. of total retention is not valid.

G. H. SMITH

Fixation of chloroform and ethyl alcohol to the red blood cell during hemolysis. G. APITZ AND M. KOCHMANN. *Arch. exp. Path. Pharm.* 87, 226-32 (1920).—During the hemolysis of ox red cells by CHCl_3 (0.2-0.25%), ether (4%), and alc. (10-15%), conducted under standardized conditions at 10-20°, definite amts. of the hemolytic agent become bound to the erythrocytes.

G. H. SMITH

Albuminoid nitrogen in the serum of cancer patients. ALBERT ROBIN. *Bull. acad. med.* 84, 51-2 (1920).—The total N of the blood serum is increased in cases with cancer and the albuminoid N is 15% higher than in normal sera.

G. H. SMITH

H—PHARMACOLOGY

ALFRED N. RICHARDS

Raying of glands and coagulation of blood. A. SZENES. Univ. Vienna. *Münch. med. Wochschr.* 67, 786-8 (1920).—Röntgen raying of the spleen decreases the coagulation time of blood, preceded by an initial increase. The coagulation time can be further decreased by intravenous injection of 10% NaCl solution. Tumor cells and lymphoid cells exposed to X-rays have the same effect but to a less degree. Exposure of normal thyroid has no effect.

S. AMBERG

The problem of the coagulation of the blood (critical remarks on the paper of Szemes, "raying of glands and coagulation of blood"). R. STEPHAN. *Münch. med. Wochschr.* 67, 992(1920); cf. preceding abstract.—Szemes detd. the coagulation time of the blood before and after the exposure of glands to Röntgen rays. This is misleading. For instance, if 0.05 cc. of serum taken before and after (8 hrs.) raying of various tissues like lungs and spleen is added to 1 cc. normal blood the serum in the case where lungs were exposed does not produce any change, while that of the case whose spleen was exposed makes the blood coagulate in half the time. S. AMBERG

Industrial tar melanosis, particularly in the manufacture of dry cell batteries. A. ARNSTEIN. *Münch. med. Wochschr.* 67, 902-3(1920).—The dry cells are put in cartons and heated tar is poured over. The room where this was done is filled with whitish brown tar vapors. As early as 2 weeks after starting, working girls showed a pigmentation of the exposed part of skin. S. AMBERG

Effect of ultraviolet rays on the eye. C. R. KINDALL. *Chem. Met. Eng.* 23, 1071(1920).—Seventeen, from a gang of 30 men, using a portable arc welding outfit, developed traumatic conjunctivitis. H. V. ATKINSON

Report of two cases of dimethyl sulfate poisoning. FERDINAND D. MOHLAU. *J. Ind. Hyg.* 2, 239-40(1920).—Edema of the lungs and increased phosphates and sulfates in the urine were found. Color vision was destroyed in one man and the field of vision reduced to one-tenth. The mucous membranes of the respiratory tract were corroded in a rabbit poisoned with this compd. and methemoglobin formed in the blood. H. V. ATKINSON

Glycerol, as a vehicle for hypodermic therapy, produces serious lesions of the subcutaneous tissue. ITALO SIMON. *Gazz. ospedali clin.* 41, 76-7(1920).—Substances insol. in H_2O which are to be introduced into the organism subcutaneously are often dissolved in glycerol. Serious lesions resulted from injections into rabbits of apts. used commonly in medical practice. As glycerol is not an indispensable solvent and vehicle, it appears advisable to substitute for it, in subcutaneous therapy, a less harmful substitute. H. W. BANKS, 3RD

Acid burns and their treatment. G. A. WELSH. *J. Ind. Hygiene* 2, 267-73(1920).—In a British factory producing concd. H_2SO_4 , oleum and concd. HNO_3 , and using these in nitration work, it is shown that one out of every four medical cases was an acid burn. Burns are classed as slight, severe, and serious. Statistics are presented for 90 cases of acid burns. Methods and operations in which accidents may result are discussed and safety precautions urged. The author explains how it is possible to det. by appearance of the burn the acid causing it. The importance of prompt first-aid treatment is stressed. The subsequent treatment at the dressing station is given. The value of picric acid gauze is emphasized. A. L. BARKER

Industrial "gassing" and the Edward Medal. THOMAS H. LEGGE. *J. Ind. Hygiene* 2, 293-7(1920).—The author cites a no. of cases of poisoning by gases and fumes in British plants as a result of attempts at rescue of fellow workmen, without adequate rescue app. He points out that the no. of industrial poisons is small, CO , H_2S , Pb , Hg , AsH_3 , and nitrous fumes being the most common. A rough system of classification of poisons, following Fischer, is suggested: (1) inorg. (a) non-metallic and (b) metallic; (2) org. (a) unsatd. C compds. and (b) aromatic series. Another brief classification, according to physiol. action, is also suggested. Cf. *C. A.* 14, 775. A. L. BARKER

Some industrial eye infections. JOHN C. BRIDGE. *J. Ind. Hygiene* 2, 274-8 (1920).—B. presents in summary some of the definite eye diseases caused by certain forms of employment, including chem. work. Conjunctival hyperemia is caused by exposure to acid fumes, esp. HCl , to Cl_2 , Br_2 , I_2 and NH_3 . Conjunctivitis may also result from HF , H_2S , SO_2 , naphtha, $MeOH$, mustard gas, as well as from ultraviolet

rays from welding arcs. Inflammation of the conjunctiva may be caused by many other chemicals, among them being basic dyes, tetryl, pitch dust, vegetable and alkaloid dust, and fulminates. Inflammation of the cornea may be produced by certain dyes, esp. Me violet, as well as by nitronaphthalene and the spicule of pitch. Retinitis results among electric welders and Pb, CS₂, dinitrobenzene and TNT workers. A few cases of diseases of the pupil, optic nerve, lens and ocular muscles are also cited.

A. L. BARKER

Experimental trinitrotoluene poisoning. SAMUEL R. HAYTHORN. *J. Ind. Hygiene* 2, 298-318(1920).—The results of H.'s exptl. work were applied in interpreting the clinical manifestations of TNT poisoning. Absorption usually takes place through the skin or along the alimentary canal. Absorption along the air passages and in the lungs is not so common. "Acute gassing" in TNT plants is not due to TNT, but to other substs. Clinical findings in exptl. dermatitis produced in guinea pigs and rabbits are given. In producing toxic jaundice and acute yellow atrophy of the liver, TNT was administered in various ways, the best being *per os*. Liver lesions similar to those in human cases were found. Methemoglobin appeared in the urine in the late toxic stages. In guinea pigs a very severe hyperplastic anemia was produced, accompanied by the appearance of nucleated red cells and an increase in reticulated cells. This anemia appears to be due to blood destruction in the circulation and not to deranged functions of the blood-forming centers. The red cells show an increased resistance to hypotonic salt solns. after recovery from severe poisoning. Animals usually recovered completely after removal from exposure to TNT. The author urges thorough blood studies in suspected human cases of TNT poisoning, and an early removal from contact with TNT.

A. L. BARKER

Osmotic effects of intravenous injection of sugar solutions. I. MAX BÜRGER AND ERICH HAGEMANN. Kiel. *Z. exp. Med.* 11, 239-56(1920).—Sugar solns. injected intravenously rapidly disappear from the blood. This rapid disappearance cannot be accounted for by renal excretion since only 10% is thus excreted. Following sugar injections there is a marked plasma increase which reaches a max. in 40 min. and does not entirely disappear in 2 hrs. Disappearance of edema following intravenous sugar injection may be explained in several ways: (1) Passage of histo-retained substances into the blood stream because of the high osmotic pressure. (2) Increase of vasoconstriction produced by sugar injections. (3) Response on the part of the kidney to the primary hydremia with a rapid excretion of the excess H₂O.

E. B. FINK

Senecio poisoning. ARTHUR R. CUSHNY AND HENRY E. WATT. Edinburgh. *Lancet* 1920, II, 1089-90.—Expts. with the active alkaloidal principles of several varieties of *Senecio* which is responsible for Pictou cattle disease show that in exptl. animals a similar condition, consisting mainly of cirrhosis of the liver and its various manifestations, is produced.

E. B. FINK

Chemically pure anhydrous dextrose as a therapeutic agent. W. H. PORTER. *Med. Rec.* 98, 973-6(1920).—P. considers dextrose from corn to be of different therapeutic availability, on account of its different chem. structure, than dextrose from other sources. He finds that it is completely utilized.

F. S. HAMMETT

Studies of "acid-soluble" phosphate in blood and plasma of various animals, and also studies of the toxicology of various phosphates. POUL IVRSSEN. *Biochem. Z.* 109, 211-25(1920).—A series of analyses is reported of bloods from rabbits, rats, guinea pigs, cats, dogs, cows and pigeons made according to the method previously described (cf. *C. A.* 14, 2649), which agree in general with the values published by Abderhalden. His studies of the toxic properties of various phosphates show that death occurs after pyrophosphate injections when the concn. of acid-sol. phosphate of the plasma reaches about 20 mg. per 100 cc., and that after metaphosphate injections a concn. of 50 mg. per 100 cc. plasma must be reached before death ensues.

F. S. HAMMETT

A pharmacodynamic analysis of Straub's morphine reaction. D. I. Macht. Johns Hopkins Univ. and Brady Urol. Inst., Baltimore. *Proc. Soc. Exp. Biol. Med.* 17, 100-2 (1920).—Investigators have shown that morphine stimulates contractions and increases tonus of smooth muscle, while papaverine has opposite effect. The morphine mol. is a combination of piperidine and phenanthrene nuclei. Expts. were made to find the effect of these nuclei separately on smooth muscle. Phenanthrene had no effect on smooth muscle. Na phenanthrenesulfonate also had little or no effect. Piperidine-HCl increased the rate and strength of contraction and tonicity of smooth muscle. Straub's phenomenon is practically brought about by injection of this compd. into a mouse or rat, and it may be ascribed to peripheral effect of piperidine portion of morphine mol.

V. C. MYERS

Phenol elimination in the dog after intravenous injection of neoarsphenamine. C. Weiss. *Proc. Soc. Exp. Biol. Med.* 17, 103-7 (1920).—A single injection of 0.841 g. of neoarsphenamine in dog caused no variation in phenol elimination for the first 5 days, an increase in free and conjugated phenols in the next 5 days, and a return to normal in the next 5 days. The "extra" phenols eliminated are equiv. to only 9.2% of the dose of drug injected. Since sulfates counteract phenol poisoning effects, phenol elimination in the same dog was studied after single intravenous dose of neoarsphenamine, during time she was receiving daily subcutaneous injections of $(\text{NH}_4)_2\text{S}_2\text{O}_8$. The persulfate did not result in elimination of any "extra" conjugated phenols, and increased free phenols only slightly during the first 5 days. After the injection of 0.841 g. of neoarsphenamine, while daily administration of persulfate continued, an enormous increase in output of "extra" free phenols, and a marked diminution in excretion of "extra" conjugated phenols was noted. Animal also showed symptoms of intoxication. W. concludes that the "extra" free phenols were due entirely to tissue destruction resulting from toxic effects of persulfate.

V. C. MYERS

Comparison of action in patients of g-strophanthin and digitalis. A. R. Corn and R. L. Levy. Hosp. Rockefeller Inst. Med. Research, N. Y. *Proc. Soc. Exp. Biol. Med.* 17, 81-2 (1920).—In some patients the action of g-strophanthin given intravenously was compared with action of digitalis given by mouth. Drugs were standardized by the cat method. One cat unit equalled 0.1 mg. g-strophanthin or 0.1 g. digipuratum. Most of patients were sufferers from fibrillation of auricles. Speed of action is often faster with strophanthin (20 min.) than with digitalis (over 2 hrs.). The effect of digitalis on rate of ventricles outlasts that of strophanthin—usually less than 5 days for the latter, and between 10 and 23 days for the former. Strophanthin has little or no effect on the T-wave of the electrocardiogram, and the effect is transient in duration. The effect with digitalis endures in a manner now familiar. With doses equal, in cat units, to strophanthin given, the effect on the T-wave is not maximal. When on occasion larger doses of digitalis were given, more striking effects on the T-wave were observed.

V. C. MYERS

Partition of zinc in the organism of the horse. G. Bertrand and R. Vlădescu. *Compt. rend.* 171, 744-6 (1920).—Thirty-one detns. were made by the method of Bertrand, each upon 5 g. of dry matter. Two of these were duplicates from the same organs of the same animal, and 4 were from the same organ of another horse. Four of the 31 gave Zn ranging from 12.2 to 18.2 mg. per 100 g. of dry matter; 17 gave between 20 and 30 mg.; 5 between 30 and 40.5 and the remaining 5 gave 68.9, 72.9, 85.1, 89.1 and 98.1 mg. and were from testicle, 2 from same animal, mammary gland, 2 from same animal, and the 98.1 mg. was found in the lymphatic ganglion. Practically all the tissues contain Zn, which varies widely in different tissues, also varies in the same tissues of different individuals, thus: 24 and 98 mg. in lymphatic ganglions, 24 and 73 in testicles, 20 and 89 in mammary glands. These results account for the dis-

cordant figures hitherto reported, and show the great mobility of Zn in the organism.

L. W. RIGGS

Estimation of the lachrymogenic power of irritating substances by the threshold method. CHARLES DUFRAISSE AND JACQUES-CH. BONGRAND. *Compt. rend.* 171, 817-9 (1920).—The method consists in comparing the activity of a given substance with that of $C_6H_5CH_2Br$ by detg. the concns. of each in atmos. necessary to produce the same lachrymogenic effect. The power of the substance studied will be inversely as its concn. thus detd. The threshold concn. ("concen. de seuil") is defined as the lowest concn. which the organs can detect during an exposure of 30 sec. Between observations complete recovery of the observer must be attained. The following numerical results are given: $C_6H_5CH_2Cl$ 2, CH_3COCH_2Br 1.8, $C_6H_5CH_2Br$ 1, CH_3BrOCH_2Br 0.25, CCl_4NO_2 0.166, CH_3COCH_2Cl 0.125, $CHOCH_2CH_3$ 0.1. L. W. RIGGS

Study of mercury injections by means of the Röntgen ray. H. N. COLE, S. LITTMANN AND TORALD SOLLMANN. *J. Am. Med. Assoc.* 75, 1559-62 (1920).—This study led to the following conclusions: The absorption of "insol." Hg preps. from intra-muscular injections can be followed admirably by Röntgen-ray shadows. The method is not applicable to sol. preps. The cases studied gave the following as the time when absorption is completed: Hg_2 salicylate: by gluteal muscles, mean 4 days; extremes 4 to 10 days. By lumbar muscles: mean 8.5 days; extremes, 2 to beyond 24 days. Calomel: means, 15 days; extremes, 4 to 39 days. Gray oil: unabsorbed during entire period of observation, a mean of 43 days; extremes of 16 to 125 days. These findings indicate that gray oil injections are both inefficient and dangerous, and their use should be abandoned. Calomel injections are also dangerous. Hg salicylate injections, especially into the gluteal muscles, give a satisfactory absorption and present relatively little danger. L. W. RIGGS

Chemotherapeutic studies with acid-resisting bacteria. A. LINDENBURG AND B. RANGEL PESTANA. *Brazil-Medico* 34, 603 (1920); *J. Am. Med. Assoc.* 75, 1602.—The active principle of chaulmoogra oil is in its acids, as it was effectual in the treatment of leprosy when used in a 2% soln. of its Na salts. The non-satd. acids in chaulmoogra and other oils inhibit the growth of acid-resisting bacteria and check the proliferation of the leprosy and tubercle bacilli. Chaulmoogra and cod-liver oils act as direct chemotherapeutic agents rather than as stimulants for phagocytosis or as tonics. Chaulmoogra oil derived from *Taraktogenos kurzii* was most potent. The destruction of the bacteria in the tissues floods the system with toxic products from the dead bacilli so that the condition may apparently grow worse. L. W. RIGGS

Formation of acetaldehyde in the body in the decomposition of ethyl alcohol. WILHELM STEPP. *Arch. exp. Path. Pharm.* 87, 148-52 (1920).—The amt. of AcH in the blood and urine was detd. after the consumption of large amts. of alc. The blood showed 1.606 mg. AcH per 100 cc. In a case of acute alc. intoxication the urine contained 0.8063 mg. AcH per 100 cc. Exptl. alc. intoxication in dogs confirmed the finding of AcH in the urine but none could be detected in the blood. G. H. SMITH

The absorption and elimination of acid and basic dyes. CARL RONDE. *Arch. ges. Physiol.* 182, 114-32 (1920).—The absorption and elimination of a large series of dyes, both acid and basic, were studied in normal frogs and in frogs whose tissue reactions were rendered of the desired H^+ or OH^- concns. Absorption from the intestine and elimination through the kidney are dependent upon the amt. of free H^+ or OH^- in the cells and tissues. The transfer of acid dyes is accelerated by H^+ and retarded by free OH^- or even completely checked. The reverse holds for the basic dyes. Basic dyes of low colloidal value, although tolerated well by the normal animal, were decidedly harmful to the acid frog; high colloidal basic dyes were easily withstood by the alk. frog, although they killed normal animals quickly. Low-colloidal acid dyes were highly toxic to alk. frogs, and high-colloidal acid dyes were tolerated well

by acid animals. Tolerance for dyes somewhat parallels the acidity or alkalinity of the animal.

G. H. SMITH

Electrocardiographic studies in acute intoxications. EDUARD SCHOTT. *Arch. exp. Path. Pharm.* 87, 309-41 (1920).—Electrocardiograms were made in intoxications with Na salicylate, C_6H_5 , pyrogallol, amyl nitrite, nitroglycerin, nitrobenzene, Me_2CO , Et_2O , $EtCl$, CCl_4 , chloral hydrate, $CHCl_3$ and $EtOH$. With Na salicylate, C_6H_5 , Et_2O , $EtCl$, CCl_4 , $CHCl_3$ and $EtOH$, there were alterations in the electrocardiographic curves sp. for each of the substances used.

G. H. SMITH

The action of calcium. RUDOLF HÖRER. *Arch. ges. Physiol.* 182, 104-13 (1920).—The contractility of heart and stomach can be abolished not only by a deficiency in Ca but also by an excess of K. The excess of K here, as in the corresponding case of muscle, can be compensated for by a large number of multivalent cations. The lack of Ca or excess of K first leads to a general pptn. of the cell colloids; secondly to a dissociation of tissue elements in some particular place, as between nerve and muscle. At this place alone is the protective action of the alk. earth compds. operative.

G. H. SMITH

Effect of cholic acid on the frog heart. H. WIRLAND AND T. HILDEBRAND. *Arch. exp. Path. Pharm.* 85, 199-213 (1920).—The effect of cholic acid in dilns. of 1:100 to 1:3200 was tested upon the isolated frog heart. In its activity the substance manifested much similarity to digitalis. With cholic acid in high concn. the reaction is instantaneous, showing no incubation period. After intoxication with cholic acid irrigation with Ringer's soln. will restore the rhythm but not the amplitude of the excursions. Atropine does not influence the intoxication. Admixture of cholic acid with blood decreases its activity, hence it shows relatively slight intoxicating power when injected intravenously.

G. H. SMITH

The slow elimination of pulegone compounds. A. RENNER. *Arch. exp. Path. Pharm.* 85, 227-9 (1920).—The Na or Mg salt of the compd. $C_{10}H_{14}OSO_3H$ was injected intravenously into rabbits. Although warm alkalies readily decompose the compd. to pulegone, no such splitting appeared to occur in the body of the animal since over a lethal dose of pulegone caused no disturbance and the substance continued to be excreted unchanged in the urine over a period of 97 hrs.

G. H. SMITH

Elimination of carbon monoxide from the blood after a dangerous degree of asphyxiation and a therapy for accelerating the elimination. YANDELL HENDERSON AND HOWARD W. HAGGARD. Yale Univ. School of Med. *J. Pharmacol.* 16, 11-20 (1920).—During the development of CO asphyxia there is vigorous hyperpnea and thereafter, probably owing to deficient oxygenation and other causes, there is a diminished production of CO_2 . Because of this asphyxiated animals when restored to pure air exhibit for 0.5 hr. a very marked depression of breathing, and the rate of elimination of CO is correspondingly slow. The abbreviation of this post-gassing period may be brought about by the inhalation of O plus CO_2 or of air plus CO; the augmented breathing allows the O to effect a rapid displacement of CO from the blood. C. J. WEST

Influence of reaction on the precipitation of protein by tannin. TORALD SOLL-MANN. Western Reserve Univ. *J. Pharmacol.* 16, 49-59 (1920).—The pptn. of proteins by tannin depends upon the H-ion concn. of the medium. With concns. of tannin such as would be used for astringent effects (0.1 to 0.5%), pptn. is maximal between $pH = 2$ to 5; with greater acidity or alkalinity, the pptn. becomes smaller. With alkalinity greater than $pH = 8$ or 8.3, there is no pptn., and, therefore, no astringency. The limits are somewhat more narrow for dil. than for concd. solns. of tannin. The pptn. limits are essentially the same for native proteins (serum and albumin) and for Witte peptone. Kraneria and catechu have the same limits as ordinary tannin. Gallic acid produces only very slight pptn. within the same limits as tannin, and probably due

to contamination with it. The astringency by tannic acid in the alimentary tracts is discussed. C. J. WEST

Comparison of the effect of certain saponins on the surface tension of water with their hemolytic power. H. E. WOODWARD AND C. L. ALSBERG. Bureau of Chem. *J. Pharmacol.* 16, 237-45(1920).—The lowering of the surface tension of Locke soln. by 12 saponins was measured; the lowest concn. at which these saponins hemolyze was also detd.; there is no parallelism between these two values. C. J. WEST

Effect of opium alkaloids on the behavior of rats in the circular maze. D. I. MACH AND C. F. MORA. Johns Hopkins Univ. *J. Pharmacol.* 16, 219-35(1920).—Morphine produces a depressant effect on the behavior of the animal, after both large and small doses. Of the other opium alkaloids, with the exception of papaverine, all were found to be slightly depressant. C. J. WEST

The influence of saccharin on the catalases of the blood. F. C. BECHT. Northwestern Univ. Med. School. *J. Pharmacol.* 16, 155-97(1920).—Four g. saccharin per kg. body wt. does not increase the catalytic power of the blood of cats when the drug is injected into the gastrointestinal tract. Wide variations in the catalytic power of the blood were noted in 2 dogs studied over a period of 73-91 days. The daily variation in the catalase content of the blood is wide. Saccharin in doses of 4 g. per kg. acts as a powerful gastrointestinal irritant. The changes in the catalase content were within the limits of the normal variation. Saccharin intravenously injected produced in practically every case a marked decrease in the catalase content of the blood. Saccharin present in amts. varying from 4 to 0.5% decreases the catalytic power of the blood *in vitro*. Thus the reduction in the catalytic power of the blood in animals injected intravenously with saccharin is probably due to the direct action of the drug upon the cells of the blood. The mechanism is probably mainly by alteration of the number of red cells per unit vol. of the blood. Removal of the pancreas has no specific influence upon the catalase content of the blood. The action of saccharin is the same in the animal with pancreatic diabetes as in the normal animal. An increase was observed in the catalytic power of the blood in 80% of the observations of patients with diabetes mellitus. The averages were about 2%, and little importance can be attached to the observation. C. J. WEST

The influence of diuresis on the elimination of urea, creatinine and chlorides. E. K. MARSHALL, JR. Washington Univ. *J. Pharmacol.* 16, 141-54(1920).—The effect of the ingestion of large quantities of H_2O (H₂O diuresis) on the elimination of creatinine, urea and chloride has been studied in normal men and dogs. The urine vol. is frequently increased 20-fold or more; creatinine is not increased to a measurable extent, chlorides are apparently increased but the increase is variable and generally less marked than that of urea. The increases in urea and chloride do not correspond with the max. increase in H_2O excretion, in fact at the height of the diuresis the chloride elimination generally decreases. During H₂O diuresis the chloride of the plasma may decrease, while the concn. of the urea and creatinine in the plasma do not vary appreciably. C. J. WEST

The clotting efficiency of thromboplastic agents: a reply. PAUL J. HANZLIK. Western Reserve Univ. *J. Pharmacol.* 16, 35-7(1920).—Polemical against Fenner, *C. A.* 14, 2221. C. J. WEST

Drugs and their active principles in relation to the treatment of disease (ROBINSON) 17.

I—ZOOLOGY

R. A. GORYNER

Effect of ions on ciliary motion. J. GRAY. *Proc. Cambridge Phil. Soc.* 19, 313-4 (1920).—Observations were made on fragments of the gills of *Mytilus edulis*. In normal

sea water, p_{H} 7.8, the motion of the cilia continues for many days but on increasing p_{H} to 6.5 quickly stops. In sea water p_{H} 6.7 the rate of ciliary motion is checked but complete recovery takes place in 45 to 90 min. Gill fragments whose cilia have been rendered motionless by more acid sea water, recover in less than 20 min. when placed in normal sea water. In still stronger acid the cells become opaque and are killed. Gills exposed to an abnormally high concn. of OH ions are either not affected, or motion proceeds at an abnormally rapid rate, while the individual cells of the ciliated epithelium break away from each other. In prep. artificial solns. for the study of salts on ciliary action it is necessary to carefully regulate the H-ion concn. In case of alkali salts this is done by the addition of NaHCO_3 . With salts of alkaline earths isotonic solns. cannot be made of the same H ion concn. as sea water and comparison must be made with sea water whose H ion concn. is abnormally high. Expts. proved that Na, K, Ca and Mg are all necessary to maintain gill fragments in a normal state of ciliary activity for four days. If one or more metals are omitted the cells act as with sea water containing an abnormally high concn. of OH ions. Solns. of single metals show this to a marked degree though they may be more acid than normal sea water. L. W. RIGGS

12—FOODS

W. D. BIGELOW AND A. E. STEVENSON

Chemistry and the food industry. CARL L. ALSBERG. *Chem. Met. Eng.* 23, 1005-7(1920).—The application of scientific research to food industries is discussed with special emphasis on the chem. problems of the milling, dairy, sugar and sugar-utilizing industries. A commercial outlet for grain sorghum by the creation of a kaft-corn-products industry is highly desirable. The chemistry involved in the retention of color, flavor and texture in finished preserved products demands attention and much may be accomplished by a study of dehydration. A new type of biochemist must be developed who applies the principles and the technic of biochemical research to the problems of agriculture and the industries using agricultural raw materials.

H. A. LEPPER

The huoying up of the equilibrium of milk salts during heat treatment. HARPER F. ZOLLER. *Science* 52, 614(1920).—An abstract. The pptn. of Ca from solns. of milk salts, prep'd. in accordance with the compn. and concn. occurring in the av. of normal cow milk and at the reaction of normal milk, was followed quant. and with the hydrogen electrode during changes in temp. The loss of Ca was progressive with the time and intensity of heat treatment. The hydrogen-ion concn. increased proportionately with the removal of the buffer material (chiefly phosphates) by the Ca. Doubling the quantity of citrates above normal, although not changing the initial p_{H} of the solns., greatly reduces the pptn. of the Ca phosphate and at the same time maintains a higher final p_{H} . Lactates and malates acted likewise. This serves to aid in explaining how the lactic souring of milk may increase its stability towards heat. E. J. C.

Sour milk samples and Gerber's fat method. F. E. DAY. *Analyst* 45, 411-2(1920).—The use of Gerber's method for detn. of fat in sour milk is apt to give very misleading results (usually 0.2% high) owing to the formation of amyl' esters of the lower fatty acids. Lactic and acetic acids appear to have little effect but butyric acid has a large effect. Propionic acid was not tried.

H. A. LEPPER

Hydrogen electrode study of the curdling in casein solutions at high temperatures. HARPER F. ZOLLER. *Science* 52, 614(1920).—An abstract. When solns. of pure Hammarsten casein in carbonate-free NaOH or KOH are heated in sealed tubes to temps. ranging from 118 to 135°, a pptn. of curd takes place, the formation of which is de-

pendent upon the hydrogen-ion concn. and the duration of heating. The casein solns. contained no Ca. All of the caseinate solns. remained clear whose initial hydrogen-ion concn. is less than 3.16×10^{-7} (p_H 6.5) although the solns. had been heated to 135° for 40 min. There is an increase in the acidity during the regular heating period of from 0.18 to 0.54 p_H corresponding, resp., to solns. of initial p_H of 5.78 and 8.26. The pptd. curd is sol. in acids and alkalies and resembles the curd made from sterilized milk or milk heated to high temps. as described by the author in a previous communication. The term β -casein is suggested for this product to differentiate it from the products obtained by Lacquer and Sackur from dry casein. The significance of these phenomena in connection with the coagulation in evapd. milk is discussed. E. J. C.

Orange vinegar—its manufacture and composition. HOMER D. POORE. *J. Ind. Eng. Chem.* 12, 1176-9 (1920).—The roller and generator processes used to produce orange vinegar are described. Analyses of vinegars made from sound and frozen fruit, showing the changes taking place during the process, are given with comparison of analyses of cider vinegar. Cost of manuf. including equipment, material and production costs is estd. from figures obtained from apple-vinegar mfrs. on oranges costing \$3 to \$20 a ton. H. A. LEPPER

The determination of crude fiber in prepared mustard. M. C. ALBRECH. *J. Ind. Eng. Chem.* 12, 1175-6 (1920).—The method of the Assoc. Off. Agr. Chem. gives high results because the oil is not removed. Add 100 cc. boiling H_2O to 8 g. sample in flask, stopper and shake, filter on paper on Büchner funnel, wash with alc. and Et_2O to remove fat. Det. fiber on the residue as usual after transferring to suitable flask.

H. A. LEPPER

The preparation and analysis of a cattle food consisting of hydrolyzed sawdust. E. C. SHERRARD AND G. W. BLANCO. *J. Ind. Eng. Chem.* 13, 61-5 (1921).—A method for the prepn. of a stock food from white pine sawdust is described. Five complete washings with H_2O equal in wt. to the wood are necessary to remove the H_2SO_4 . The sugars were found to leach somewhat slower than the acid and are not appreciably affected by drying the moist product at 75 - 85° C. Analyses of white pine sawdust and product obtained after digesting with dil. H_2SO_4 under pressure are given and the differences discussed.

H. A. LEPPER

Ripening and storage of Bartlett pears (MAGNESS) 11D. The determination of formic acid in the presence of acetic acid (BULIR) 7. Apparatus for making a soluble extract of coffee, etc. (U. S. P. 1,358,048) 1.

Substitute for milk and cream. G. D. THEVENOT. U. S. 1,359,633, Nov. 23. A liquid food simulating cow milk is prep'd. by cooking soy beans until softened and sterilized and the coloring matter has been removed, sepg. free liquor and crushing the solid material to a fine pulp, mixing the latter with sterilized and slightly alk. H_2O , digesting with proteolytic enzyme in the presence of NaCl, sepg. the H_2O and the material which it carries in soln. and suspension, and adding to it fats, oils and sugar.

Sterilizing fruit juices. J. G. F. HIEBER. Brit. 149,537, Sept. 17, 1919. Fruit juice from a press is run through the cylinders of a preheater in which it is heated by the sterilized juice, then along a pipe through the cylinders of a sterilizer heated by steam or hot water, through the preheater on the outside of the cylinders, through the cylinders of a cooler in which cold H_2O or brine circulates, and then to storage tanks to which CO_2 may be supplied. The juice enters at the base of the cylinders and leaves at the top. A suitable construction is specified.

13—GENERAL INDUSTRIAL CHEMISTRY AND CHEMICAL ENGINEERING

HARLAN S. MINER

A retrospect and forecast of chemical merchandizing. PHILIP S. TILDEN. *Chem. Age* 28, 436(1920). E. J. C.

Expression and progress in the technical professions. HOMER A. WATT. *Chem. Age* 28, 419-21(1920).—A discussion of the methods and problems of making technical students better writers. E. J. C.

Relationship of cost accounting to business management in chemical manufacture. WM. B. FERGUSON. *Chem. Age* 28, 413-5(1920). E. J. C.

How chemists can cooperate in fire prevention activity. J. C. McDONNELL. *Chem. Bull.* 7, 296-8(1920). E. J. C.

Cooperation of the colleges and industry in the development of managerial ability. HOLLIS GODFREY. *Chem. Age* 28, 411-2(1920). E. J. C.

Chemical industry and trade of France. O. P. HOPKINS. *J. Ind. Eng. Chem.* 13, 6-13(1921). E. J. C.

The manufacture of fine chemicals in England. ANON. *Can. Chem. J.* 4, 337-8 (1920).—A list is given of such chemicals made in England and those the manufacturers are prepd. to make. E. J. C.

Engineers in governmental functions. PAUL KREUTZPOINTNER. *Chem. Met. Eng.* 23, 1101(1920). E. J. C.

Engineering societies and engineering education. IRA N. HOLLIS. *Eng. Education* 11, 94-138(1920). E. J. C.

Industrial engineering as a major profession. ANON. *Iron Age* 106, 1331-5(1920).—Abstracts of papers and discussion at the Pittsburgh meeting of the Soc. of Industrial Engineers. E. J. C.

The fuel-oil situation on the Pacific Coast. D. M. FOLSOM. *J. Electricity* 45, 523-5(1920).—Suggests hydroelec. development. C. G. F.

Lubrication—a problem of colloid chemistry. A. BENCKE. Munich. *Seifenstieder-Ztg.* 47, 759(1920).—A review of Lord Ralclgh's work on formation and properties of films of one mol. thickness (about 1 $\mu\mu$). These thin layers are the active agent in lubrication and their presence constitutes the best condition for gliding surfaces. Graphite fills the numerous pores of an uneven metallic surface, forming a bed upon which the molecular oil film can rest. Perfect and clean surfaces do not glide but adhere to each other. P. ESCHER

Notes on lubrication. OWEN LINLEY. *Elec. Times* 58, 209-11(1920).—The general theory of lubrication is discussed, and suggestions are given as to the selection and method of using lubricants for steam turbines, Diesel power plants, gearing, line shafting and general machinery. Oil may be tested for solid impurities by spreading a small amt. of the oil on a sheet of clean paper, when, upon holding up to the light, solid particles are easily visible. The presence of acids can be detected by placing a little of the oil on a clean sheet of brass or copper; after a week, the metal will show a green spot if acid is present. Oil can be tested for gumming or oxidation by spreading a film of oil upon a sheet of glass or metal; after a week it should not have lost its greasy feeling, when rubbed with the tips of the fingers. The comparative merit of different oils can be tested, by placing a few drops of each on an inclined metal or glass sheet; the best oil will travel farthest in a given time. NATHAN VAN PATTEN

Separation of slimes from liquids by centrifuging. BERTHOLD BLOCK. Charlottenburg. *Chem. App.* 7, 156-8, 161-3, 171-3(1920).—Third supplement to B.'s former article (*C. A.* 14, 1872, 3505) in which he discusses "the maximum limit to which the rate of sepn. by centrifugal force may be increased, and its dependence on the strength

of the centrifugal drum," with mathematical formulas and 5 cuts. Other supplements follow. J. H. MOORE

Contents of horizontal hoilers. A. LUCHT. *Chem. App.* 7, 163-4 (1920).—L.'s former table (*C. A.* 14, 1239) with corrections. J. H. MOORE

Separation of colloidal materials. W. A. DRANE. U. S. 1,359,037, Nov. 16. Colloidal material is removed from various associated substances by use of packing house "stick" to convert it into readily separable form. The stick may be used either as a flocculating or dispersing medium depending on the character of material under treatment. When employed as a coagulating or flocculating agent, the stick causes the colloidal matter originally present to coagulate or flocculate and settle out. When employed as a dispersing or deflocculating agent, the colloidal material is held in suspension during the fractional settling of other suspended substances to be recovered. Tests on the particular substances determine the preferred manner of use of the stick. One use of the stick proposed is the removal of colloidal impurities from a pulp containing $Al_2(SO_4)_3$ or other Al salt in soln. such as is obtained in the production of Al salts from bauxite or other Al ore. The stick may be employed as originally obtained in dil. form or after concn.

Fractional distillation. J. V. JOHNSON. Brit. 149,776, May 20, 1919. In fractionating petroleum and other liquids, the vapors from the still are passed through a series of rectifiers connected by atm. condenser pipes and by reflux pipes for the condensates. The rectifiers are so constructed that the condensate entering a bottom compartment by the reflux pipe flows upwards through tubes projecting into a compartment, where the condensate is brought into contact with the vapors and is thereby heated. The resulting vapors pass into the condenser pipes and the remaining liquid flows by the reflux pipe to the next rectifier. The condensate may be further heated by means of an open steam pipe or while passing through an intermediate heating compartment.

Purifying liquids by settling. J. DENGEL. Brit. 149,551, Oct. 14, 1919. In app. for sepg. solids from liquids by settling, *e. g.*, paper pulp from H_2O , in which the material treated is introduced into the top of an inverted funnel, the sepn. taking place as the mixt. flows down the funnel, the heavy material is withdrawn continuously at the bottom app., while the purified liquid flows upwards through an outer casing, so shaped that the liquid substantially maintains the velocity with which it leaves the funnel. A suitable construction is specified.

Filtering media. J. J. HOOD. Brit. 149,453, May 20, 1919. A granular aluminous material, for use in the purification of coal gas, or the decolorization of oils, etc., is prep'd. by moistening finely divided aluminous material, such as ptd. Al_2O_3 , bauxite dust, or China clay, with an acid or an Al salt soln., heating to form an agglomeration, then either crushing this and calcining at a dull red heat or *vice versa*, and finally grading the product. The Al_2O_3 may be increased by adding pure Al_2O_3 to the starting material. Cf. 7,032, 1905, and 16,617, 1908.

Treating gases with liquids. T. SCHMIEDEL. Brit. 149,647, Mar. 31, 1920. Gases are brought into intimate contact with liquids in an app. in which a gas entering by a pipe is subjected to the action of a spray from a rotating roller or drum dipping into a liquid, a part of the gas being drawn under the surface of the liquid by the action of the drum. A suitable construction is specified.

Drying gas. F. C. FRARY and S. TEMPLER. U. S. 1,359,047, Nov. 16. Moist Cl or similar gas to be dried is brought into contact with Fe or similar material which, although originally not deliquescent, forms a deliquescent substance on contact with the gas.

Plastic compositions. C. H. IVINSON and G. S. ROBERTS. Brit. 149,365, Nov. 19, 1918. A compn. of paint impervious to oils, spirits, petrol, H_2O , etc., and particularly

applicable for coating the interior of concrete tanks, etc., consists of $ZnCl_2$ 30-65 parts, ZnO 30-35 parts, and NH_4Cl 2-20 parts, with the addition of H_2O and other ingredients for adding wt. hardness, for binding and other purposes. The additional ingredients comprise $MgCl_2$, MgO , SiO_2 , borax, powdered glass, an agglutinant, such as dextrin, starch, glue, or sol. gum, portland cement, and plaster of Paris. The ingredients may be mixed together and stored in a finely ground anhydrous condition or the chlorides may be dissolved separately and the soln. used as a vehicle to be mixed with the other powdered ingredients when the compn. or paint is required for use.

Acid-proof buildings and structures. P. L. FRANNENNSCHMIDT. Brit. 149,667, July 30, 1920. H_2SO_4 chambers or towers or any other structure for holding or conducting acid gases, are formed of a rigid acid-proof window-shaped framework in which are inserted sheets of acid-proof material such as quartz glass, enameled metal or glass. The framework may be of Fe, coated with an acid-proof coating such as enamel or Pb, or of an acid-proof material such as "neutral" Fe or (for HCl plants) Al. The framework may be stiffened by suitable struts, and, for making HCl, may be in the form of a rigid bell suspended in a simple manner. The sheets are held in place by auxiliary frames secured to the framework in any suitable manner, and the clearing spaces may be filled in with acid-proof putty such as water-glass putty. When using quartz-glass plates, a damaged plate may be mended by sticking a piece of quartz glass over it with water-glass putty. A suitable construction is specified.

Filter for lubricating oils, etc. G. C. SCHMIDT. U. S. 1,360,148, Nov. 23.

Apparatus for reclaiming used automobile engine oil. J. R. MILLER. U. S. 1,359,614, Nov. 23. Steam is injected into the oil in order to vaporize impurities of low b. p. and the oil is then treated with a hot soap soln.

Bearing of vitrified shale. H. R. STRAIGHT. U. S. 1,360,244, Nov. 23. Machine bearings are formed of natural shale by cutting it to the desired shape of the bearing, gradually heating it to the point of vitrification and then cooling. Bearings thus formed are stated to be suitable for use with steel shafts in adding machines or clocks.

14—WATER, SEWAGE AND SANITATION

BY RICHARD BARTOW

Water testing with the Dionic apparatus. ANON. *Water and Water Eng.* 22, 283-6(1920).—The Dionic app. for detg. cond. of water is described. Cond. measurements are useful for detecting slight changes in the mineral content of previously analyzed waters, for detecting condenser leaks, and boiler priming, and as a means of water-softening control.

R. E. GREENFIELD

Mailing-case method for long-distance bacteriological control of water supplies. M. H. McCRADY. *J. Am. Water Works Assoc.* 7, 845-51(1920).—The mailing case has compartments for four glass tubes of approx. 10 cc. capacity. Each tube as sent out contains 2 cc. concd. lactose medium; five cc. of the water to be tested are added to each, the tubes recorked and returned by mail. A simple procedure in the laboratory makes incubation possible in the original tube. The equipment is inexpensive, time is saved and the results are quant.

D. K. FRENCH

Municipal water supply of Montreal. THOMAS W. LE SAGE. *J. Am. Water Works Assoc.* 7, 892-902(1920).—Three-fourths of the supply is filtered and all is sterilized with hypochlorite. Full details are given.

D. K. FRENCH

Index numbers and scoring of water supplies. II. ABEL WOLMAN. *J. Am. Water Works Assoc.* 7, 927-30(1920); cf. C. A. 14, 303.—Further observations are recorded.

D. K. FRENCH

Filter underdrains, sand-bed and washwater experience. Edited Symposium. *Eng. News-Record* 85, 934-9, 984-7(1920).—A symposium on current practice and

operating success with various details of mechanical filter plants, with discussion on perforated-pipe underdrains, gravel depths, blow-ups, mud balls and washings.

FRANK BACHMANN

Method of applying alum directly to filter beds at Oshkosh, Wis. R. A. MADDOCK. *Eng. Contr.* 54, 553 (1920).—After a filter is washed a soln. of $Al_2(SO_4)_3$ is applied directly to the water on the bed, and allowed to stand before filtration begins.

LANGDON PEARSE

New Orleans waterworks notes. G. G. EARL. *Ann. Rep. Water & Sewerage Bd.* 1919; *Public Works* 49, 556-8 (1920).—Cost of operating large filtration plant was \$9.04 per mil. gals. Wash water av. was 0.35%. Coagulants used were, in grains per gal., lime 4.60, $FeSO_4$ 0.69. 150,000 cu. yds. wet mud were removed from settling basins. Typhoid death-rate has fallen to 13 per 100,000 in 1919. Malaria death rate has been cut to 4 per 100,000.

LANGDON PEARSE

Planning the future of the Cleveland water supply. A. V. RUGGLES. *Eng. News-Record* 85, 836-9 (1920).—The program includes the installation of 2 new intakes by 1940 and appurtenances costing 30 mil. dollars.

FRANK BACHMANN

Pollution of public water supply by spring freshet. THEODORE HORTON. *Pub. Health Reports* Oct. 29; *Eng. Contr.* 54, 562-4 (1920).—This describes an epidemic of gastro-enteritis followed by typhoid fever caused by gross pollution of the well water supply of Schenectady from overflow from the polluted Mohawk River. An old suction pipe connection passed the water to the underground collection gallery.

LANGDON PEARSE

Algae cause odors from Monoa Lake at Madison, Wisconsin. ALVORD & BURDICK, H. L. RUSSELL AND CHANCEY JUDAY. *Eng. News-Record* 85, 907-8 (1920).—The offensive odors were traced to prolific growths of blue-green algae and not to the city sewage effluent and industrial wastes discharged into the lake. Treatment of the lake with $CuSO_4$ is recommended to stop the growth of algae. During the spring and summer the water should be under const. biological observations. It is also recommended that the sewage effluent be discharged into deep water to eliminate unsightly shore conditions.

FRANK BACHMANN

New sewage-treatment plant of Okmulgee. A. H. KENDRICK. *Pub. Works* 49, 473-5 (1920); *Eng. Contr.* 54, 559-60 (1920).—Okmulgee has a population of 17,430, which is served by a 21-inch outfall emptying to a pumping station which feeds 2 Imhoff tanks. The settled liquid is sprinkled over a sprinkling filter, $5\frac{1}{2}$ ft. deep. Two sludge beds each 40×60 ft. are provided.

LANGDON PEARSE

Experimental sewage irrigation plant in Florida. F. E. STAEBNER. *Eng. News-Record* 85, 848-9 (1920).—Sewage from the University of Florida is treated in a septic tank followed by trickling filter. The effluent is pumped to cultivated fields for irrigation.

FRANK BACHMANN

Nine years' operation results of the municipal garbage reduction works at Columbus, Ohio. JAMES W. FOLLIN. *Eng. News-Record* 85, 991-4 (1920).—All factors being considered the net cost per ton of garbage disposal was 46 cents without interest and 87 cents with interest.

FRANK BACHMANN

The conduct of electrolytic ions in solid bodies. II. Dissociation relations in permutterite (GÜNTHER-SCHULZE) 2. Apparatus for distilling water, etc. (U. S. PAT. 1,359,276) I.

Water filter. A. L. GAMMAGE. U. S. 1,358,840, Nov. 16.

Preventing incrustation in evaporators. MASCHINENBAU-AKT.-GES. BALCK. Brit. 148,547, July 10, 1920. Addition to 135,189 (C. A. 14, 872). Free acids or easily sol. salts are added to the water before it enters an evaporator so that the salts forming

scale or sediment remain in soln. during the evapn. and may be drawn off with the 'muddy water.'

Treating waste organic substances with steam and sulfur dioxide. A. MAC-LACHLAN. U. S. 1,359,085-6, Nov. 16. Waste org. material such as garbage or sewage is treated with steam and SO_2 to cause a sepn. of fatty substances. An app. is described. The material sepd. from grease is dried for use as a fertilizer.

15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

The Association of Official Agricultural Chemists. HERMANN C. LYTHGOE. *Chem. Age* 28, 405-6(1920).—Descriptive. E. J. C.

The capillary potential and its relation to soil moisture constants. WILLARD GARDNER. *Soil Sci.* 10, 357-9(1920).—A consideration of the equation of Briggs (U. S. Dept. Agr., Bur. Soils, *Bull.* 45) with a system of curves satisfying those equations is given. W. J. ROBBINS

Influence of moisture on the bacterial activities of the soil. J. E. CREEVES AND E. G. CARTER. *Soil Sci.* 10, 361-86(1920).—The ammonification, nitrification and N fixation in 22 soils, varying from loose sand to tight clay, at varying moisture contents was detd. Every soil gave max. ammonification at a moisture content equal to 60% of its moisture-holding capacity. Max. nitrification occurred at 50-60%, varying with the soil. Many of the soils showed two maxima for N fixation, one at 50-60% and another at 70-80%. Formulas are given for the max. bacterial activities based on the formulas of Briggs for moisture equiv., wilting coeff. and hygroscopic coeffs.

W. J. ROBBINS

Nitrification in Texas soils. G. S. FRAPS. Texas. Agr. Exp. Sta., *Bull.* 259, 37 pp.(1920).—Nitrification studies were conducted by keeping the soil in percolators and NO_3 was extd. at intervals of 4 weeks. Usually the max. nitrification took place during the 1st four weeks, but with some soils it is delayed and the max. did not occur for a year. Nitrification on an av. is in proportion to the total N of the soil. From 7 to 10% of the total N of a soil is converted into NO_3 during the 1st 12 weeks. The quantity of NO_3 produced in soils depends on the quantity of org. N contained in them, the form of chem. combination, the physical condition and the chem. compn. of the soil. Acid soils nitrify slightly less than non-acid and with a low Ca content. The nitrification of subsoils varies widely. They av. about the same as surface soils. Addition of P, K or CaCO_3 to a soil stimulates its nitrifying power. P is more effective than K. J. J. SKINNER

Relative value of acid phosphate and rock phosphate on North Carolina soils. C. B. WILLIAMS, W. F. PATE, E. C. BLAIR, S. C. CLAPP AND F. T. MEACHAM. North Carolina Dept. Agr., *Bull.* Whole No. 269, 41, No. 8, 22 pp.(1920).—Expts. were made for 10 yrs. on several of the principal soil types of the state. In a comparison of acid phosphate and rock phosphate used separately on different plots, each with N and K, and with legumes turned under, acid phosphate gave greater returns.

J. J. SKINNER

The role of copper in anticryptogamic sprays. G. VILLENIUS. *Compt. rend. agr. France* 6, 762-8(1920).—In acid sprays, their acidity is due to the hydrolysis of the CuSO_4 in excess and the alkalinity of such sprays is due to Ca or Na carbonate. Sprays are supposed to be chemically neutral but in practice are always either acid or basic, due to either an excess of the carbonate or of the CuSO_4 . Experimenters cited used sprays made of NiSO_4 and CdSO_4 which were equally as successful as were those of CuSO_4 . Many fungi were grown upon 10% copper citrate (ammoniacal) and *Peni-*

ciliium glaucum even grew upon a satd. soln. of this salt, which shows that Cu is not the toxic element. The details of carrying out expts. to show that Cu is not the toxic element are recorded. It was further shown that if an excess of certain salts of Ca, Mg, K, Ba, or Cd was added the spores did not germinate. It is concluded that the acid or basic properties of the spray modify the chemistry of the spores so that germination does not result. *Phytophthora infestans* was grown in a soln. which contained 1 pt. in 1000 of ammoniacal copper citrate; it produced conidiophores and comidia, which showed that Cu was not poisonous to *P. infestans*. F. M. SCHERTZ

Insecticide and fungicide legislation in the United States, with special reference to the Federal insecticide act of 1910. J. K. HAYWOOD. *J. Assoc. Off. Agr. Chem.* 4, 11-38(1920).—An address. E. J. C.

The relation of nitrates to nodule production (STROWD) 11D. Treating waste organic substances with steam and sulfur dioxide (U. S. Pat. 1,359,085-6) 14.

Treating phosphate rock for fertilizer. G. R. BROST. U. S. 1,360,248, Nov. 23. A fertilizer containing available phosphate and potash is prep'd. by calcining a mixt. of phosphate rock, feldspar, limestone, Fe ore, furnace slag and Na₂CO₃. The gases volatilized are collected by a spray of ammoniated H₂O, producing (NH₄)₂CO₃.

16—THE FERMENTATION INDUSTRIES

H. S. PAYNE

Further contribution to the chemically defined catalysts of alcoholic fermentation. C. NEUBERG AND MARTA SANDBERG. *Biochem. Z.* 109, 290-329(1920).—The effects of 82 different substances on alc. fermentation are reported. The compds. used are classified as: (A) Substances of sugar-like structure, as glycolaldehyde; these exert a stimulating effect. (B) Aldehydic and ketonic alkaloids such as pelletierine; these also activate the fermentation, as do the members of group (C) the natural and synthetic diketones and quinones, such as isatin and quercetin. (D) N- and O-containing org. compds. as *m*-dinitrobenzene, nitroethane, etc., all of which tend to cause an increased CO₂ production. (E) S and Se compds., among which are cystine, Na₂SeO₃, and NaCNS. (F) Metallic compds. of Fe, Cu, Sn, Ce, V, U, etc. Groups E and F both stimulate CO₂ production. Like results were obtained when living yeast was used instead of the sep. enzyme and the action depended in all cases upon the concn. of the added substances. The findings are interpreted as supporting the theory that there exists a relation between fermentation activation and deoxidation. F. S. H.

The three types of fermentation of sugar as a common consequence of the dismutation activity of inorganic and organic agents which produce alkaline reaction. CARL NEUBERG AND WERNER URSUM. *Biochem. Z.* 110, 193-215(1920).—N. and U. have found a large number of substances which alter markedly the normal carbohydrate decompn. both qual. and quant. The results of the studies lead to the not unimportant conclusion that the inorg. or org. compds. producing an alk. reaction in soln. influence alc. fermentation in the same sense that they bring about the biochem. splitting of sugar according to the third type of fermentation as represented by the equation: 2C₆H₁₂O₆ + H₂O = CH₃COOH + C₂H₅OH + 2CO₂ + 2C₃H₈O₃. F. S. H.

The course of the alcoholic fermentation of yeast. II. ERICH KÖHLER. *Biochem. Z.* 110, 128-32(1920).—Tables and charts are given showing that fermentation influences the sugar concn. in that high and low points regularly follow one another, giving a zigzag form to the curve of sugar utilization, which seems to follow some law. K. designates this as the "zigzag phenomenon." Cf. C. A. 14, 3258; 15, 289.

F. S. HAMMETT

Alcohol production from wood. FOTH. *Z. Spiritusind.* 43, 341-2 (1920).—A discussion of the Pringsheim process for hydrolyzing wood and utilizing the residue as a feeding stuff. W. B. V.

Swiss wine statistics. Prepared by the SCHWEIZERISCHEN VEREIN ANALYTISCHER CHEMIKER. 20th year. The wines of 1919. *Mitt. Lebensm. Hyg.* 11, 255-92 (1920).—Analytical statistics. E. J. C.

Yeast. L. J. P. M. J. DUPIRE. Brit. 149,438, May 13, 1919. In prep. yeast by fermenting a suitable liquid and sepg. the yeast in centrifugal separators, as described in 123,711 (*C. A.* 14, 309), the liquid is dild. to the least strength that will allow the yeast to attain its full development. *E. g.*, a liquid containing molasses and sugar-beet pulp is dild. before fermentation until the resulting density is about 1.03.

Yeast. H. W. ANDERSCHOU. Brit. 149,533, Sept. 5, 1919. Brewers' yeast is treated to prep. a yeast for baking purposes by washing it through a sieve, adding a mixt. of NaHCO_3 and Na salicylate, and after some time a soln. of borax. After settling, the H_2O is poured away and the yeast is washed with a soln. of NaCl , K_2CO_3 , or other cleansing agent, and then with H_2O . A nourishing soln. containing phosphates of K , NH_4 , and Mg , H_2PO_4 , cane sugar, pepsin, and an infusion of willow leaves, is added, and filtered air is passed through the mixt., which is cooled. The liquid, if acid, is neutralized with $(\text{NH}_4)_2\text{CO}_3$ and allowed to settle. The settled yeast is mixed with cream of tartar, potato flour, and dried milk powder, and compressed. Distillery yeast may be added.

Acetone, butyl alcohols. C. WEIZMANN. Brit. 149,355, Feb. 24, 1916. Acetone and butyl alcs. are prep'd. by fermenting wort with the bacteria described in 4,845, 1915. The wort is prep'd. in the manner ordinarily used by Brewers and distillers, but with less malt than usual and without hopping, and is sterilized. The ordinary brewery or distillery plant is modified by the provision of vessels in which sterilization under pressure may be effected, and by the use of enclosed coolers, and of closed fermenting vessels which may be sterilized and to which sterilized air or gas may be supplied.

Recovering values from distillers' slops. H. P. BASSITT. U. S. 1,357,138, Oct. 26. Slops such as result from the treatment of black strap molasses are filtered and treated with a salt (which is adapted to form hydroxides of different degrees of oxidation and also to form an insol. basic salt with acids of the volatile fatty acid series) such as FeSO_4 , $\text{Fe}_2(\text{SO}_4)_3$, and MnSO_4 or $\text{Mn}_2(\text{SO}_4)_3$, which may be added in an amt. equal to about 2-4% the wt. of the liquor treated. The slops may be boiled for 5-10 min. after adding the salt. $\text{Ca}(\text{OH})_2$ is then added to the heated mixt. in slight excess over the amt. required to convert the metal salt or salts into hydroxides. The liquor turns a light green color and is then boiled for several hrs. while air is blown through it. This oxidation is continued until a filtered sample is of an amber color. At such time the carbohydrates present have formed an insol. basic compd. with the metal hydroxide. The product is then filtered and the filtrate is slightly acidified and if H_2SO_4 is used for this purpose the CaSO_4 formed is sepd. The clear liquor is then concd. to 2-5% its original vol. *in vacuo* and a small amt. of K salts is thus ptd. and removed. The liquid sepd. from these salts is distd. with steam to obtain glycerol.

Fermentable sugars from cellulose. G. H. TOMLINSON. U. S. 1,358,898, Nov. 16. Sawdust or similar cellulosic material is beaten in a closed vessel with a hydrolyzing agent such as dil. H_2SO_4 or H_3SO_3 until fermentable sugars are formed and the pressure in the vessel is then quickly reduced below atm. pressure and the volatile reaction products distd. off. An app. is described. The immediate distn. *in vacuo* of the volatile products serves to prevent undesirable secondary reactions.

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

Recent developments in connection with arsphenamine. A. BINZ. *Z. angew. Chem.* **33**, I, 265-7 (1920).—A review with references. E. J. C.

Pharmacy in the Argentine Republic. F. VERZIGNASSI. *Pharm. Post* **53**, 283-4 (1920).—The article describes the economic conditions prevailing during and since the war, notably with respect to chem. and pharm. products. W. O. E.

Alkali lactates as glycerol substitutes. C. NEUBERG AND E. REINFURTH. *Ber.* **53**, 1783-91 (1920).—While fermentation glycerol from sugar is obtainable in a yield of 20-25% at the most, the same material is capable of producing 95% and more of its weight of lactic acid, the Na and K salts of which are eminently suited to serve as substitutes for glycerol and were so employed by the Central Powers during the war in the recoil systems of light and heavy artillery, minc throwers, in naval guns, field kitchens, for medicinal and cosmetic requirements, for the macroscopic preservation of organs, etc. Per-glycerol (Na salt) was used in a concn. of 45% as recoil medium, instead of 65% glycerol formerly employed. The K salt (perka-glycerol) was employed in the place of glycerol in the Kaiserling or Pick liquid for preserving anatomical specimens. The salty taste of perka-glycerol when used for internal medication can, if objectionable, be corrected by addition of saccharin. The lactates of organic bases, aniline and pyridine lactate, were employed as solvents for dyes. The Na and K lactates, while ordinarily amorphous, were obtained in the form of solid crystalline masses. Since, however, fermentation lactic acid presents a mixture of racemic and optically active isomers, none of the salts was isolated with a constant content of H₂O of crystn. The paper concludes with tables and curves embodying the essential physical constants of per- and perka-glycerol, as the d., freezing and b. p., hygroscopicity and viscosity values with varying concn. W. O. E.

Melting point of acetylsalicylic acid. C. AHRENS. *Pharm. Ztg.* **65**, 800-1 (1920).—Referring to Auerhach's recent article (*C. A.* **14**, 3121), A. shows that while the commercial product is ordinarily understood to apply to an acid complying with the requirements of the D. A.-B. 5 the conception of the term "commercial" ("handelsüblich") is a widely varying one and hence misleading, that an acetylsalicylic acid in the original container does not necessarily fulfill all requirements for purity, that the m. p. detd. under widely varying conditions invariably fell below 130°, for which reason A. sees no grounds for changing the D. A.-B. 5 method. In this connection reference is made to expts. made by G. Cappelli to det. what effect, if any, various solvents have on the m. p., thus with aq. acetone and EtOH, benzene and CCl₄. In all cases the lower values were obtained than with the original product. It was shown that the acid adsorbs 1.7629% of its wt. from surrounding moisture, suffering a depression in the m. p. of about 4°. W. O. E.

Masking the presence of free salicylic acid in acetylsalicylic acid. A. N. SMITH. *Analyst* **45**, 412 (1920).—The substances capable of producing such interference are certain strong organic acids, as tartaric and citric acids, the latter especially when present in the proportion of 1% being sufficient to mask about 0.2% of free salicylic acid. Such acids if present may be readily detected after removal of the salicylic acid and its acetyl compd. from a cold aq. ext. of the tablet, and conversely the free salicylic acid can be estd. colorimetrically after sepn. by means of some suitable solvent which does not extract the interfering substances. All samples of aspirin tablets, therefore, which after being powdered give no violet coloration with FeCl₃ test soln. should be viewed with suspicion. W. O. E.

Chemistry of digitalis. H. C. HAMILTON. *J. Ind. Eng. Chem.* **12**, 1180-1 (1920).—By means of mixed miscible solvents (alc.-CHCl₃), the author has succeeded in iso-

lating from digitalis two active agents, although probably still in impure form, one sol. and the other insol. in CHCl_3 , such behavior however being apparently so dependent on the presence or absence of other constituents of digitalis or on a mixt. of the 2 active agents that it is exceedingly difficult to arrive at a point where the complete solv. of the one or insol. of the other can be established. Furthermore, the similarity of the pharmacologic effects of the 2 substances tends towards skepticism as to the correctness of this sepn. into 2 parts of dissimilar solubilities. The activities of these 2 agents in terms of the leaf of av. potency considered as 1, are: CHCl_3 -insol. 100, CHCl_3 -sol. 70. It appears that the CHCl_3 -insol. principle is responsible for between 65 and 75% of the potency of the leaf, as measured by the M. I. D. or M. S. D. on frogs. The writer expresses the hope that a definite method for obtaining 1 or more active principles of digitalis will soon be available, whereby such principles can be sepd. and prep'd. for therapeutic use in pure form.

W. O. E.

The biochemical recognition of atropine. T. TOGAWA. *Biochem. Z.* 109, 43-6 (1920).—When vitamine preps. are intravenously injected an increased flow of saliva is produced (Uhlemann, *Z. Biol.* 68, 1918) which is prevented if the animal is previously injected with 0.04 mg. atropine. T. tested the reaction on rabbits, using "orypan" and oat ext. as the vitamine prep., against atropine plus coniine, physostigmine, pilocarpine, nicotine, brucine, veratrine, codeine phosphate, colchicine, digitalin, aconitine, apomorphine, narcotine, delphinine, thebaine, papaverine, cocaine, or emetine. Negative results were obtained in all cases, from which T. decides that since no other alkaloids influence the reaction it is specific for atropine. F. S. HAMMETT

Drugs and their active principles in relation to the treatment of disease. B. ROBINSON. *Med. Rec.* 98, 983-4 (1920).—A comparison is made of the therapeutic effect of several well known drugs and the synthetic compds. alleged to be the active principles thereof, with the plea that possibly these highly purified compds. do not deserve the demands supplied by the more crude preps. F. S. HAMMETT

Valuation of digitalis leaves. G. JOACHIMOGLU. *Arch. exp. Path. Pharm.* 86, 307-42 (1920).—Various solvents and varied methods of extn. were employed to det. the procedure which would yield the greatest amt. of active substance. Comparative results showed that the Soxhlet extn. with abs. alc. produced the largest yield. Cold water and 50% alc. gave a yield of about 60%; tincture prep. methods gave 75%; CHCl_3 extd. only 33% of the glucoside; benzene followed by abs. alc. yielded 70%; acetone was unsuited. In all methods the extn. was incomplete. G. H. SMITH

Physical properties of some alkaloids. H. ZEEHUISEN. *Arch. exp. Path. Pharm.* 86, 342-72 (1920).—The physical properties of 42 alkaloids are described and tabulated. In Group I, that of the hydroxyphenylalkylamine and phenylalkylamine bases, only adrenaline is described. The pyridine derivs. (Group II) are represented by coniine and nicotine; the pyrrolidine derivs. (Group III) by atropine, hyoscyamine, homatropine, cocaine, scopolamine, sparteine, and piperine. Group IV, quinoline compds., includes quinine and related bodies, strychnine, and brucine. The isoquinoline group (V) is represented by hydrastine, papaverine, narceine, and narcotine. Morphine, codeine, thebaine, heroine, and dionine fall in Group VI. Compds. of the purine group, xanthine, hypoxanthine (sarcine), theohromine, theophylline, caffeine, and pilocarpine as well, are placed in Group VII. Substances whose chem. structure is incompletely known are placed in Group VIII, and such substances are described as solanine, colchicine, aconitine, beheerine, gelsemine, delphinine, cevadine, veratrine, emetine, and pelletierine. The tabulated data include formulas, mol. wt., crystalline form (or amorphous condition), melting points, boiling points, color, odor, solv. in water and oil, ρ_H values, viscosities, $[\alpha]_D$ values, colloidal or crystalline character of the solns., and in particular the electrical charge as modified by different conditions of soln.

G. H. SMITH

The stability of benzyl alcohol solutions. DAVID I. MACHY AND ALFRED T. SHOHL. Johns Hopkins Univ. *J. Pharmacol.* 16, 61-9 (1920).—Solns. of benzyl alc. kept in non-sol. glass preserve their anesthetic properties for long periods of time and such solns. tend to increase their H-ion concn. very slowly. Kept in soft glass or alkaline containers, the solns. become alkaline in reaction and rapidly deteriorate in their anesthetic efficiency. Benzyl alc., to be preserved, should be free of BzH and sealed in hard glass ampoules after the addition of a buffer soln.

C. J. Wiger

Anesthetic. O. KAMM, R. ADAMS and E. H. VOLWILER. U. S. 1,358,750, Nov. 16. β -Dibutylaminoethyl p -aminobenzoate is prepd. as follows: p -Nitrobenzoyl chloride dissolved in C_6H_6 and β -dibutylaminoethyl alc. are heated under a reflux condenser, the reaction mixt. is shaken with dil. HCl and the aq. layer treated with Sn and HCl. The temp. is kept at about 50° to minimize hydrolysis; when the heat of reaction no longer maintains this temp., external heat is applied. The soln. is poured off from the excess of Sn, dild. with H_2O and freed from Sn by H_2S . Upon filtering and making the filtrate alk., the desired ester seps. and may be extd. and combined with HCl to form the monohydrochloride, which crystallizes from H_2O in white crystals, m. 170-2°. The $Bu_3NCH_2CH_2OH$ used is formed by condensation of ethylene chlorhydrin and Bu_3NH_2 ; it b. 225-230° under atm. pressure with slight decompn.

Anesthetics. O. KAMM, R. ADAMS and E. H. VOLWILER. U. S. 1,358,751, Nov. 16. γ -Dibutylaminopropyl p -aminobenzoate is prepd. by a process similar to that of U. S. 1,358,750. Its hydrochloride m. 104-5°. The product is a local anesthetic. Various salts may be produced from the free base, e. g., the hydrobromide m. 143°. Other similar compds. which have been prepd. in like manner are: γ -Diisobutylaminopropyl p -aminobenzoate hydrochloride, m. 169°; the corresponding isoamyl compd., m. 169-70°; the corresponding isopropyl compd., m. 178-9°. The various bases may be converted into salts of nitric, lactic, succinic, tartaric or boric acids.

Antiseptic and disinfectant. F. S. MARDON. U. S. 1,358,227, Nov. 9. An antiseptic and disinfectant adapted for use on wounds is formed of a 1-3% picric acid soln. 4, $KClO_3$ at least 3, tincture of I at least 5, chlorinated lime about 5, $NaHCO_3$ and glycerol 50 parts.

Mydriatine and methylmydriatine. W. N. NAGAI. U. S. 1,356,877, Oct. 26. Mydriatine (a mixt. of two racemic forms of phenylaminopropanol) and monomethylmydriatine, pupil-dilating drugs, are produced by the following method. Benzaldehyde and nitroethane are permitted to react in alk. soln. to form phenylnitropropanol which is recovered as an oily residue by treating the reaction mixt. with ether, sepg. the ether soln. from an aq. layer, washing it with H_2O and with a concd. soln. of $NaHSO_3$ to remove unchanged benzaldehyde and distg. the ether soln. *in vacuo* after further washing it with H_2O . The phenylnitropropanol is dissolved in dil. alc. and reduced at a low temp. with CH_3O , Zn dust and $AcOH$. Excess Zn is sepd. as sulfide after addition of H_2S and alc., H_2O and $AcOH$ are removed by distn. *in vacuo*. The thick liquid remaining is shaken with dil. HCl soln. and ether to remove resinous substances which may be present and remaining traces of $AcOH$. The aq. layer is sepd. from the ether and is evapd. to dryness at a low temp. *in vacuo*. The residue thus obtained is the hydrochloride of phenylmethylaminopropanol, in the form of a cryst. mass from which transparent, colorless, small prismatic crystals can be obtained by recrystn. from soln. in a small amt. of abs. alc. This product resembles the alkaloid ephedrine obtained from *Ephedra vulgaris* in its physiological action. The crystals m. 182°, and are readily sol. in H_2O and alc. to a neutral soln.

18—ACIDS, ALKALIES, SALTS AND SUNDRIES

T. LYNTON BRIGGS

Investigation on pyrolytic production of phosphoric acid. WILLIAM H. WAGGAMAN AND THOMAS B. HURLEY. *Chem. Met. Eng.* 23, 1057-63 (1920); cf. *C. A.* 14, 2529.—Further expts. with run-of-mine phosphate and a semi-works-scale oil-heating furnace have shown the possibility of volatilizing 97% of the P_2O_5 and condensing this as a highly concd. H_3PO_4 in an elec. precipitator. The cost of the process per ton of P_2O_5 is estd. at \$49.83 on a daily production of 30 tons P_2O_5 , assuming 90% yield. Itemized costs are given. This is 2.49 cents per lb. P_2O_5 for the process described, as compared with 6.25 cents, the av. present selling price of P_2O_5 for fertilizer purposes, and 4.6 cents per lb., the av. present manuf. cost as acid phosphate, obtained by averaging the costs of three large mfrs. On the basis of the data so far obtained the prospects for the new process seem bright, especially when it is considered that the product is concd. and will hence stand heavy transportation charges and that the life of the phosphate deposits will be greatly prolonged because the new process permits the employment of a low-grade material. F. C. Z.

Nitric acid manufacture. L. MAUGÉ. *Industrie chimique* 7, 265-6 (1920); cf. *C. A.* 14, 3298.—Description is given of the Uebel process in which the manuf. of HNO_3 from $NaNO_3$ is continuous. The app. is described and a diagram is given. The principles of the process are discussed and results of an operation are given including the yield. The advantages of the process also are described. ISMAR GINSBERG

Sodium compounds in 1919. ROGER C. WELLS. U. S. Geol. Survey, *Mineral Resources of U. S., 1919*, Pt. II, 47-76 (preprint No. 5, publ. Nov. 16, 1920); cf. *C. A.* 14, 209. E. J. C.

Industrial production of crystal soda. A. Z. *Seifensieder-Ztg.* 47, 771-8, 787-8 (1920).—A detailed description of the manuf. of soda based on practical experience. P. ESCHER

Bibliography of the technology of nitrate. ALEJANDRO BERTRAND. *Caliche* 1, 18 (1919).—A complete bibliography of the chemistry and technology of the nitrate industry up to the close of 1918. C. L. BURDICK

Specific gravity of caliche. FRAZER AND SOUTHWARD. *Caliche* 1, 9 (1919).—A discussion of the methods of detg. the sp. gr. of caliche is given and there are recommended two methods suitable for field use, both of which involve in principle the measuring of displaced vol. of kerosene by a known wt. of caliche. C. L. BURDICK

Process of Prache and Bouillon for the manufacture of nitrate. SAMUEL DEL CAMPO. *Caliche* 1, 61 (1919).—The process of Prache and Bouillon comprises (1) the app. for leaching of the caliche with the production of a hot concd. soln. of nitrate and the other sol. salts (caldo); (2) app. for the evapn. of the liquid and pptn. of the nitrate; (3) a series of app. for compressing the steam from the evaporators. The general idea of the process is hot leaching with evapn., but proposes the substitution for multiple-effect evaporators of steam compression app. which by compression of the steam from the boiling tanks shall raise the temp. and pressure so that it can be used as live steam for further evapg. C. L. BURDICK

Evaporating apparatus and its use in the nitrate fields. J. L. G. *Caliche* 1, 81 (1919).—This is a discussion of the attempted application of multiple-effect evapn. to solns. arising from the leaching of caliche. The two great hindrances to its application have been the corrosion of the heating coils by liberated I and the impracticability of operating with more than double effect due to the low vapor pressure and, therefore, high temps. of the steam from the boiling solns. The author believes the difficulties with the evaporators will ultimately be solved and that the nitrate process of the future

will be founded on low-temp. lixiviation followed by evapn. of the solns. to a hot concd. state and with subsequent cooling and crystn. of the nitrate. C. L. BURDICK

Reflections upon nitrate technology. Ludovico PERRONI. *Caliche* 1, 93(1919).—Discussion of the general and particular aspects of the industry showing that with continuously decreasing nitrate contents in the fields worked and with the present developed methods, or probable future ones, a lowering in the cost of production is most unlikely. C. L. BURDICK

Potassium nitrate. J. T. C. PEGOAR. *Caliche* 1, 84(1919).—By covering the crystg. pans (bateas) and thus avoiding the daily heating effect of the sun's rays it was found that the temp. of the crystg. solns. would fall as much as 4° below that of the regularly operated pans. The nitrate fraction crystallized from the ordinary mother liquor at this lower temp. was found to be very rich in potash, averaging around 20% KNO_3 . C. L. BURDICK

Patents of inventions referring to the extraction of nitrate. ANON. *Caliche* 1, 25,64(1919).—A summary of patents issued between 1853 and 1907 bearing on the extn. of nitrates. The second article also includes a discussion of these patents in their relation to their actual application in the industry, and traces the course of technical progress in the industry from the time of Haenke in 1809 to the present date. C. L. BURDICK

The separation of mineral matter from natural flake graphite. W. C. RATLIFF AND J. D. DAVIS. *Chem. Met. Eng.* 23, 1027-8(1920).—Expts. show that light graphite, flake or amorphous, may be cleaned by agitation with oil and water, light volatile liquids such as C_4H_8 , C_2H_4 , and CCl_4 are even better. The agglomerates formed with the volatile liquids are less viscous and the mineral matter is sepd. with less agitation than in cases where heavy oil has been used. Fineness has a direct bearing upon the effectiveness of the cleaning. W. H. BOYNTON

Manufacture of fine chemicals in England (ANON.) 13. Acid-proof buildings and structure (BRIT. pat. 149,667) 13.

Sulfuric acid. T. SCHMIETEL and H. KLENCKE. Brit. 149,648, Mar. 31, 1920. H_2SO_4 is produced by causing gases containing SO_2 to come into intimate contact with the largest possible quantity of $\text{H}(\text{NO})\text{SO}_4$, at between 54-8° Bé., in the form of sprays in a mixer, and passing the unabsorbed gases and the nitrous gases liberated during the reaction in the mixer up an irrigator packed with filling material and sprayed with acid of the same strength and compn. as that supplied to the mixer. SO_2 , entering by a pipe, passes through a number of units connected in series. The $\text{H}(\text{NO})\text{SO}_4$ from a tank supplies the irrigators and also the mixers. Arriving at the first mixer, part of the acid is tapped off to the denitrator and removed from the system while the remainder is returned to the tank through receptacle and pump. The spraying is effected by means of rollers, etc., or by any other means. In the mixer 50% of the SO_2 is oxidized, but owing to the increase in the concn. of the H_2SO_4 , a tendency is set up for $\text{H}(\text{NO})\text{SO}_4$ to be formed, and oxidation to cease. By washing the gases in the irrigator the $\text{H}(\text{NO})\text{SO}_4$ goes into soln., and simultaneously the nitrous gases are absorbed and carried back to the mixer. It is possible to have only one mixer and one irrigator in a complete unit; and a number of units may be connected in parallel, each independent of the other. The compn. of the acid distributed from a tank is regulated by the addition of H_2O and HNO_3 , and as the quantity of nitrous gases at any point depends solely upon the quantity of SO_2 reacting with the $\text{H}(\text{NO})\text{SO}_4$, both gases will be removed from the issuing gases at the same time.

Phosphoric acid from phosphate rock. F. S. WASHBURN. U. S. 1,359,211, Nov. 16. Phosphate rock and silica are preheated in a rotary kiln. The preheated charge is

then heated to a melting temp. on a hearth furnace and from the latter is discharged into an elec. furnace to which C is supplied and in which phosphorous gases and vapors are evolved and these volatilized products are mixed with air and led counter-current to the flow of solid and molten material passing through the rotary kiln and hearth furnace and the H_3PO_4 vapors are then recovered. An app. is described. Cf. *C. A.* 14, 3765.

Sodium amide. O. LIEBKNECHT. U. S. 1,359,080, Nov. 16. In producing Na amide by the reaction of NH_3 on Na at a temp. of about 380° the use of NaOH as a catalyst increases the fixation of NH_3 from 50% without any catalyst to 59% using 5 g. of NaOH per 2000 g. Na and 97% when using 60 g. NaOH per 2000 g. Na. Cr tungstate, Cr oxide, Co oxide and NaOH together with Cr oxide also promote the reaction to a high degree. Alloys of alkali metals with Pb or Hg may be used instead of Na alone in the reaction.

Sodium bicarbonate. T. NISHIOAWA. U. S. 1,359,097, Nov. 16. See Brit. 135,831 (*C. A.* 14, 1013).

Potassium ammonium hydrogen phosphate. S. S. SADTLER. U. S. 1,357,120, Oct. 26. Finely ground phosphorite 1000 is mixed with a 27.2% soln. of H_2SO_4 1000 parts and the mass is stirred and after standing until the reaction is completed is divided into 2 portions. (A) To one portion there is added 167 parts K_2SO_4 and 300 parts of H_2O (calcd. on the basis of the starting materials originally employed in the process) and the mixt. is heated and agitated and after cooling is lixiviated with H_2O and the filtered soln. is retained for use as described below. (B) To the other portion of the original divided reaction mixt., there is added $(NH_4)_2SO_4$ 127 and H_2O 300 parts and the combined mixt. is digested and lixiviated and the soln. obtained is mixed with the soln. obtained by the procedure "A" and the combined soln. is concd. and crystd. to obtain KNH_4HPO_4 . If Na_2SO_4 be employed in the process instead of K_2SO_4 , $NaNH_4HPO_4$ may be similarly obtained. Phosphorite residue remaining from one operation may be introduced into a succeeding batch to secure more complete utilization. Heating to 120 – 140° may be found desirable to expedite the reactions.

Potassium carbonate. E. P. STEVENSON. U. S. 1,360,046, Nov. 23. In making K_2CO_3 or $KHCO_3$, a soln. of $KOAc$ in $EtOH$ is treated with CO_2 and NH_3 to form insol. $KHCO_3$ and $HOAc$, the $KHCO_3$ is sepd. from the soln. and the elec. soln. is subsequently treated with $Ca(OH)_2$ to produce $Ca(OAc)_2$ from the NH_4OAc present. The $Ca(OAc)_2$ thus obtained is converted into $KOAc$ for continuing the process.

Leaching and recovery of nitrates and chlorides. W. E. GIESEKKE. U. S. 1,357,973, Nov. 9. Raw material such as "caliche" is leached with H_2O and blown with a current of air or H_2O under pressure to effect disintegration of the material in the leaching liquid and forcing of the finely divided solids above the coarser material. The raw material is allowed to settle to form a filter bed and the soln. is drawn off and filtered through the filter bed so that the finest material is deposited on top of the bed. Fresh leaching agent is then forced through the filter bed from below upwardly, air is blown through the material and leaching agent under pressure and the soln. is drawn off and filtered through the settled material.

Concentrating sulfite and sulfate solutions. E. ÖMAN. U. S. 1,359,911, Nov. 23. Sulfite or sulfate solns. are concd. by subjecting the soln. while it is stirred to a temp. below the f. p. and then sepg. the crystals of ice from the soln.

Magnesium chloride. E. O. BARSTOW. U. S. 1,359,782, Nov. 23. Slaked dolomitic lime is treated with SO_2 and CO_2 and $CaCl_2$ is added to the mixt. to produce $MgCl_2$.

Anhydrous magnesium chloride. E. A. ASHCROFT. U. S. 1,359,652, Nov. 23. In dehydrating hydrated $MgCl_2$ with gaseous HCl , the dehydration is first partially completed so that the temp. of fusion is raised above 250° and a slow current of HCl is afterward applied to remove the remaining H_2O of hydration. An app. is described.

Crude cyanide. W. S. LANNIS. U. S. 1,359,257, Nov. 16. A crude cyanide mixt. containing a large proportion of CaCN_2 mixed with fluxing materials and CaO is produced by heating a mixt. of "lime nitrogen," CaC_2 and a small amt. of NaCl to a temp. of about 1300° or higher and then immediately cooling the product to below 400° in order to prepare it for packing and shipment.

Apparatus for fixing nitrogen as cyanide. C. T. THORSSELL and H. L. R. LUNDEN. U. S. 1,357,196, Oct. 26. The furnace is adapted for producing cyanide by the reaction together of C, N and carbonate. N is introduced into the reaction chamber under pressure and gases from the reaction chamber are led through a nengine where their power of expansion is used to develop power and then are turned to utilize further their energy.

Apparatus for making alkali metal cyanide. F. J. METZGER. U. S. 1,358,383, Nov. 9. The app. comprises a retort with an inner shell of Fe or similar readily oxidizable metal and an outer shell spaced from it with the intervening space filled with an inert gas such as N passed later to the reaction zone. The outer shell is formed of oxidation-resisting material, e. g., silica or fire clay, and is exposed directly to the furnace gases for heating the retort. The app. is adapted for producing NaCN from Na_2CO_3 , C and N.

Rotating inclined-retort apparatus for the manufacture of alkali-metal cyanides. F. J. METZGER. U. S. 1,358,014, Nov. 9. The app. is adapted for heating a mixt. of Na_2CO_3 , C and Fe while passing N through it.

Protecting reaction vessels from oxidation in cyanide manufacture. H. B. KIPPER. U. S. 1,358,161, Nov. 9. In producing cyanides by heating a mixt. of Na salts with C and Fe and N in a vessel formed of wrought Fe or similar metal, oxidation of the reaction vessel is prevented by heating the vessel by a combustion of carbonaceous fuel so regulated that CO mainly is produced, with but little CO_2 and without excess of O.

Aluminium nitrate. J. J. HOOD. Brit. 149,783, May 20, 1919. Al nitrate is obtained by the interaction in aq. soln. of $\text{Al}_2(\text{SO}_4)_3$ with a suitable nitrate, such as Ca, Ba, K or NH_4NO_3 , or according to the provisional specification, $\text{Pb}(\text{NO}_3)_2$. In the case of K or NH_4 nitrates, the proportions employed may be such as will allow of the sepn. by crystn. of K or NH_4 alum, leaving the Al nitrate in the mother liquors.

Potash alum. T. H. WRIGHT. U. S. 1,359,011, Nov. 16. An aq. soln. containing KCl is treated with MgSO_4 or Na_2SO_4 and a soln. of $\text{Al}_2(\text{SO}_4)_3$ is added, to form potash alum, and the latter is allowed to crystallize. This soln. may be slightly acidified with H_2SO_4 .

Soluble compounds from feldspar and similar minerals. H. S. BLACKMORE. U. S. 1,357,025, Oct. 26. MgSiF_6 is used instead of Na_2SiF_6 in a process similar to that of U. S. 1,355,794.

Soluble compounds from feldspar and similar minerals. H. S. BLACKMORE. U. S. 1,355,794, Oct. 12. Finely ground orthoclase or similar material is mixed to a thin paste with Na_2SiF_6 soln. and the mixt. is heated to a temp. of about 175° under a pressure of about 200 lbs. per sq. in. for 3-5 hrs. which effects conversion of the greater portion of the K silicate into K_2SiF_6 which is recovered by dissolving it in hot H_2O . On cooling the soln. of K_2SiF_6 the latter crystallizes out and is sepd., leaving a mother liquor which may contain any excess of Na or Fe silicofluoride formed. The K_2SiF_6 produced is treated, in hot aq. soln., with NH_3 and CO_2 to form $(\text{NH}_4)_2\text{SiF}_6$ and K_2CO_3 which may be sepd. from each other by fractional crystn. The Na_2SiF_6 used in the process may be produced by the interaction of K_2SiF_6 with NaNO_3 and the KNO_3 and Na_2SiF_6 formed may then be sepd. by their different solvys. in H_2O .

Rotary inclined retort adapted for calcining barium carbonate. P. REECKE. U. S. 1,358,327, Nov. 9.

Purifying brine. F. A. FREETH. Brit. 149,707, Feb. 15, 1919. In the process

for the removal of the Ca and Mg salts from brine by the addition of Na_2CO_3 and Ca or Na hydroxide, the brine is maintained at a temp. of about 25° and is gently stirred. Under these conditions the ppt. of CaCO_3 and $\text{Mg}(\text{OH})_2$, which is ordinarily of a colloidal form, assumes such a physical character that it settles rapidly. Cf. 3,559, 1878, and 4,175, 1874.

Alumina. J. MOREL. Brit. 149,769, May 17, 1919. Al_2O_3 is obtained from bauxite or other aluminous material by furnacing the latter in the presence of SO_2 , air and steam, lixiviating the product, and then decomposing the resulting ferruginous soln. of $\text{Al}_2(\text{SO}_4)_3$ by means of $\text{Na}_2\text{S}_2\text{O}_3$ according to the equation $\text{Al}_2(\text{SO}_4)_3 + 3\text{Na}_2\text{S}_2\text{O}_3 = \text{Al}_2\text{O}_3 + 3\text{SO}_2 + 3\text{S} + 3\text{Na}_2\text{SO}_4$. The ppt. of Al_2O_3 and S is calcined to produce pure Al_2O_3 and SO_2 . In order to make the process cyclic, the SO_2 from this source, as well as that evolved according to the equation, may be utilized both for the furnacing operation and for the regeneration of the $\text{Na}_2\text{S}_2\text{O}_3$. The latter is prep'd. by evapg. to dryness the soln. of Na_2SO_4 which remains after filtering off the Al_2O_3 and S, reducing the sulfate to sulfide by means of C, and then passing air and SO_2 into the aq. soln. of Na_2S . If the process is not intended to be cyclic, the S is sepd. from the pptd. Al_2O_3 by distn. or dissolution. To facilitate the furnacing operation, the gases may be passed over a catalyst such as Fe_2O_3 ; or a catalyst, such as Al or other chloride, may be added to the bauxite.

Zinc and other oxides; basic lead sulfate. NEW JERSEY ZINC CO. Brit. 149,925, Nov. 24, 1919. In the production of volatilizable metal oxides and compds. such as ZnO and basic PbSO_4 by blowing air through a mixt. of fuel and ore on a bed of ignited fuel, the ignition fuel or the ore or the reducing coal is used in the form of briquets, for instance of double pyramidal form on a common square base of $1\frac{1}{4}$ in. side, the distance between the apexes being $1\frac{1}{2}$ in.; or the ore and reducing fuel may be briquetted together, and some ore may be briquetted with the ignition fuel. The binding agent may be sulfite cellulose liquor; and a pressure of 2000 lb. per sq. in. may be used in the briquetting. The briquets are dried and baked by stacking on trays in a tunnel drier at 200° . The pressure of the blast is less than in the known process and it may sometimes be dispensed with, the fan which draws the fume through the bag room being sufficient to draw enough air through the charge.

Zinc and other oxides; basic lead sulfate furnaces. NEW JERSEY ZINC CO. Brit. 149,927, Nov. 26, 1919. In the production of volatile compds. such as Zn and other oxides and basic PbSO_4 from ores by the Wetherill process on a traveling hearth, the bed fuel or the reduction fuel or the ore or any two or all of them are briquetted as described in 137,513 (C. A. 14, 1417) and the bulk of the fuel, for instance, 75-85% of the total fuel, may be arranged in the fuel bed, the remainder being mixed with or briquetted with the ore as described in 147,530 (C. A. 14, 3765). A traveling-hearth furnace is described.

Zinc oxide; shaft furnaces. H. E. L. FIEVET. Brit. 149,303, July 17, 1920. ZnO is obtained from ores such as calamine or roasted blends by grinding the ore, agglomerating with C and CaO , and treating in a furnace having a grate and chamber with an air blast to volatilize metallic Zn , which is then burnt with additional hot-air blast at the upper part of the furnace. A suitable construction is specified.

Nitrogen oxides. L'AZOTE FRANÇAISE SOC. ANON. Brit. 149,304, July 17, 1920. N oxides are recovered from gas mixts. in a concd. state by absorbing them in anhydrous Al_2O_3 which has been dehydrated at a comparatively low temp. such as 400° to form addition products such as $2\text{Al}_2\text{O}_3\text{NO}_2$ which on heating to about 70 - 120° give up the N oxide. If the heating is effected in a partial vacuum, a lower temp. such as 40° may be used. The absorption is effected at a low temp. dependent on the diln. of the gas mixt. For arc gases, temps. lower than -20° and as low as -80° may be used, whereas with concd. gases ordinary temps. are sufficient. It is stated that in the long

run, traces of moisture which gain access to the app. cause the formation of hydrated Al nitrate which prevents absorption. When this stage is reached, the material is calcined at 400° to recover anhydrous Al_2O_3 which is then again available for use.

Arsenic oxides and sulfides. H. J. Wilson. Brit. 149,366, Jan. 3, 1919. Arsenic ores are roasted in a portable app. and the condensed impure oxide is re-sublimed in an elec. furnace. The portable roasting and condensing plant may be set up near an ore deposit, and the elec. furnace may be at a distant central station. A suitable app. is specified.

Reducing sulfur dioxide. T. SHIMOMI. U. S. 1,359,114, Nov. 16. SO_2 or a gas containing SO_2 is mixed with steam and a reducing gas such as CO and coal gas and the mixt. is passed into a chamber filled with CaS , an alk. metal sulfate or an equiv. catalyst, heated to a temp. of about 350-800° in order to obtain free S which is volatilized and condensed.

Decolorizing carbon. A. KNÖPFLMACHER. U. S. 1,358,162, Nov. 9. A highly active decolorizing charcoal is produced by neutralizing waste sulfite liquor from cellulose manuf. with an alk. earth base such as CaO , evapg. to dryness with K_2CO_3 and then heating to redness.

Decolorizing carbon. R. W. MUMFORD. U. S. 1,359,094, Nov. 16. A decolorizing carbon is formed by making a dough-like mixt. of powdered coaly material and tarry material, e. g., a mixt. of powdered brown coal and dolomite with ammoniacal gas tar, and charring the mixt. in a vented retort through which a current of dry steam is passed to facilitate removal of vapors, the heating being gradually continued until a temp. above 600° is attained.

Cleansing carbon black and other finely divided materials with steam. J. C. MORRELL. U. S. 1,359,091, Nov. 16. Superheated steam is blown through carbon black or other decolorizing or absorbent materials of microscopic fineness, at a temp. of about 450-600° to purify them. An app. is described.

Formaldehyde condensation products with carbamide or its derivatives. H. JOHN. U. S. 1,355,834, Oct. 19. Condensation products are formed by heating a soln. of CH_3O with carbamide, thiocarbamide, acetylcarbamide, benzoylcarbamide or similar carbamide derivs. If the heating is restricted to a short time, the condensation products formed are sol. in H_2O . These products are good adhesives and leave a transparent colorless product when dried. They may be used for joining glass, metals or other materials, for filling root canals in dental surgery or as a lacquer or for coating airplane wings or other fabrics. When the heating is carried out for a longer time in the original condensation operation, the resulting products will be fluid while hot but when cooled will gelatinize. These products are insol. in H_2O and may be used as substitutes for rubber or celluloid.

Phenolic condensation products. L. V. REDMAN, A. J. WEITH and F. P. BROCK. U. S. 1,358,394, Nov. 9. After obtaining a fusible, substantially anhydrous phenolic condensation product containing more than 2 phenolic groups to each methylene group, a molding material adapted to a quick-molding operation and subsequent heat treatment after removal from the mold for hardening purposes may be produced by mixing with the fusible, substantially anhydrous resin a sufficient amt. of fibrous filler such as asbestos to give the desired consistence and sufficient $(CH_3)_2N$ or other methylene-containing material to produce a hard and substantially infusible material. Preferably a small quantity of a solvent such as creosote oil is added to the material. The product is heated and dried and comminuted to prep. it for molding. The molding may be performed in a few seconds under a pressure of 5,000 to 15,000 lbs. per sq. in. Various fillers such as mica, flock or wood pulp may be used. The molded articles are cured by prolonged heating adjusted according to the character of the article.

Waterproofing composition. C. J. NETHERCOTT. U. S. 1,359,826, Nov. 23.

A compn. for waterproofing leather, canvas or other materials is formed of varnish 5 qts., Japan sizing 3 qts., black paint 8 qts., beeswax 25 oz., glycerol 25 oz., eucalyptus oil 10 oz., sweet oil 6 teaspoonfuls and turpentine 2 gals.

Polishing composition. J. F. LINANE. U. S. 1,359,401, Nov. 16. A compn. suitable for polishing wood or metals is formed of mineral oil 60%, soy-bean oil 20%, turpentine 10% and gasoline 10%, carrying a half oz. of tripoli to each gal. of the liquid.

Cleaning compositions. J. V. LONNEN. Brit. 149,507, July 15, 1919. A cleaning and polishing compn. consists of, say, 6 oz. soap dissolved in 1 gal. of H_2O and mixed with 1 gal. of gas oil, and 4 lbs. of finely powdered SiO_2 , to which 1 oz. of oil of mirbane may be added.

Plastic compositions; coatings and dressings; adhesives; cements. L. LILIENFELD. Brit. 149,319, May 14, 1920. Plastic and elastic masses are obtained by mixing alkyl, aryl or aralkyl ethers of cellulose, starch, dextrin or other carbohydrates having the empirical formula $C_6H_{10}O_5$, or of their derivs. or conversion products, with the viscous oily liquids obtained when C_6H_6 reacts in the presence of $AlCl_3$ with the hydrocarbons occurring in tar oils and possessing a b. p. above 140°. Mixing may be effected with or without the aid of a volatile solvent such as benzene, benzene-alc., CCl_4 , $CHCl_3$, chloroform-alc., acetone, or acetone-alc.; and to the mixt. may be added other plastic substances or agglutinants such as cellulose nitrate, acetate or other esters, and other coloing or softening agents such as camphor, phosphoric esters of phenols, or animal and vegetable oils, as well as dyes, filling materials, and inorg. or org. pigments. The products obtained may be used as substitutes for india rubber, etc., and in the manuf. of artificial leather, films, photographic articles and coatings, lacquers, varnishes, paints, elec. insulating materials, dressings for fabrics, leather, paper, etc., sizing and coating materials, printing and thickening materials for pigments, artificial thread or hair adhesives and cements. In examples, a celluloid is prep'd. from a viscous liquid as above mentioned and a water-insol. ethyl- or benzyl-cellulose or starch, with or without the aid of a solvent for the ether; an artificial leather from a soln. containing ethylcellulose, the viscous liquid in question, and benzene or benzene-alc., the soln. being applied in one or several layers to fabric or paper; an artificial leather by applying a mixt. of ethyl- or benzyl-cellulose or starch and the viscous liquid with or without a small proportion of solvent; and the last-mentioned compn. is also used for the insulation of cables, etc.

Airplane fabrics. N. A. T. N. FEARY. Brit. 149,745, May 15, 1919. Airplane non-conducting flexible fabric is provided with an electrically deposited metallic coating for the purpose of fireproofing and strengthening it. The fabrics described in 128,690 and 134,611 are given this treatment, and are first satd. in boiling linseed oil under pressure. When dried to a tacky condition, the surfaces are coated with plumbago and then passed in contact with conductors such as metal rollers through a $CuSO_4$ soln., the fabric constituting the cathode. The speed through the soln. is such as to ensure a deposit of one-thousandth of an inch in thickness. The fabric is finally washed in hot H_2O and dried.

Material for gun wads. W. G. BOND. U. S. 1,358,279, Nov. 9. Gun wads are made of compressed comminuted cork impregnated with glycerol, gelatin, H_2O and paraffin.

Chemical production of fog screens. T. R. LEIGH. U. S. 1,358,084, Nov. 9. A cloud screen is formed by feeding into a stream of steam under pressure substances such as S_2Cl_2 or similar chlorides which on hydrolysis form acids, thus hydrolyzing these substances, and then bringing the hydrolyzed products into contact with NH_3 so that the salts formed will serve as nuclei around which much of the excess steam will condense.

Mixture for sealing closures. A. R. SCARLETT. U. S. 1,359,434, Nov. 16. See Brit. 136,355 (C. A. 14, 1197).

Sound records. R. HEAD. U. S. 1,358,949, Nov. 16. A sound record is originally made in wax, a reverse is molded from it in clay or plaster, a copy of the original is molded from the clay or plaster in more durable material such as type metal, a steel negative is pantographed from the latter and a thin sheet of metal is pressed into the steel copy. If desired, the clay reverse may be hardened by firing and used directly as a working matrix for forming records.

Asphalt-coated sealing strip. F. W. FARRELL. U. S. 1,358,834, Nov. 16. A strip adapted for sealing fiber board cartons is formed of paper coated with asphalt containing a sufficient proportion of clay or other pulverized mineral substance to render the asphalt not adhesive at ordinary temp. but capable of becoming adhesive when heated.

19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, A. V. BLEININGER

The composition of lead glasses. R. J. MONTGOMERY. *J. Am. Ceram. Soc.* 3, 900-12(1920).—This is a graphical study of 32 typical glasses with curves plotted to show the relation between refractive index or dispersion and content of fluxes. On a triaxial diagram PbO , SiO_2 , and $\text{K}_2\text{O} + \text{Na}_2\text{O} + \text{CaO}$ these glasses appear on a line running straight from PbO , SiO_2 towards $\text{K}_2\text{O} \cdot 6\text{SiO}_2$ down to 20% lead. Below this it curves ending at $\text{RO} \cdot 2\text{SiO}_2$ with not over 70-72% SiO_2 (C. J. Wright, previous abstract). An attempt is also made to show the excess SiO_2 or PbO contained in soln. in the various glasses. J. S. LAIRD

Certain relations between chemical composition and refractivity in optical glasses. F. E. WRIGHT. *J. Am. Ceram. Soc.* 3, 783-832(1920).—Graphical methods were used extensively in the soln. of one phase of the war-time problem of optical glass manuf., the selection of batches necessary to reproduce glasses of known characteristics. When the refractive indices of various glasses are plotted against mean dispersions the older flint and crown glasses lie on a straight line dividing the field, with the newer barium and borosilicate glasses showing much lower dispersion for the same refractive index. Plotting the ratio of partial dispersions for red and blue ends of the spectrum against the refractive index gives well marked fields for the various glasses, this ratio being largest for the fluor crown glasses, with the borosilicate crowns, ordinary crowns, barium crowns, barium flints and flints in order named. From the analyses of known glasses, the approx. compns. of glasses of intermediate optical properties could be deduced by interpolation. When the compns. of the older flint glasses were plotted on a triaxial diagram SiO_2 , PbO , $\text{K}_2\text{O} + \text{Na}_2\text{O}$ they lay in a very narrow straight band between the limits $\text{PbO} \cdot \text{SiO}_4 + \text{K}_2\text{O} \cdot 6\text{SiO}_2$ or $\text{Na}_2\text{O} \cdot 4\text{SiO}_2$. Glasses too high in silica are too difficult to melt; high in alkalies are hygroscopic, and high in lead tend to crystallize. In the newer glasses the diagram is very similar when plotted on the triaxial diagram $\text{SiO}_2 + \text{B}_2\text{O}_3$, $\text{PbO} + \text{ZnO} + \text{CaO} + \text{BaO}$, $\text{K}_2\text{O} + \text{Na}_2\text{O} + \text{Al}_2\text{O}_3$. From the data and diagrams batches giving very closely the desired properties could be calcd., due allowance being made for losses of lead and alkalies during melting. J. S. LAIRD

Annealing of glass. L. H. ADAMS AND E. D. WILLIAMSON. Geophys. Lab. *J. Franklin Inst.* 190, 597-631, 835-70(1920).—In order to anneal glass properly, the rate of release of the internal stresses must be known for the various glasses and the various temps. A record is given of such measurements for 9 kinds of glass; and mathematical formulas are derived for calcn. of the release of stress, and for calcn. of the stresses due to heating or cooling various shapes of glass. At any temp., a glass requires a certain annealing time which is arbitrarily defined as the time required to reduce the stress, in optical units, from 50 to 2.5 micromicrons per cm. The annealing range is

the interval of 150° lying immediately below the temp. at which the annealing time is 2 min. Very little permanent stress can be introduced at temps. below the annealing range. Concrete directions are given for annealing various kinds of glass; the best procedure is to hold the glass at a const. temp. at the annealing point for the proper time; then to cool at an increasing rate.

JOSEPH S. HEPBURN

The expansion of glass at high temperatures. W. B. PIETENPOL. *Chem. Met. Eng.* 23, 876-7 (1920).—The expansion of relatively large samples of glass, 76 cm. long, was detd. from room temps. up to the softening point, about 750° . The samples were heated in an elec. furnace so designed as to give a very uniform temp. distribution. The expansion was measured by means of microscopes focused on scratches on the glass or solid particles on its surface. Results show that rate of expansion of annealed glass is const. up to 450 - 550° . The rate then increases by four to six times through a range of 60 - 100° . Above this range the rate is a little greater than at first up to the softening point. With unannealed glass there is a decreased rate for 100 - 150° just before the rapid expansion occurs. The temp. at which the rapid expansion occurs is the temp. necessary for annealing.

J. S. LAIRD

Glass colors. *Schnurpeil's Rev. Glass Works* 4, 685 (1920).—The normal color for the ordinary coloring oxides in various kinds of glass is given:

Metal oxide.	Lead glass.	Potash glass.	Soda glass.
Silver oxide		Yellow or orange	Yellow or orange
Chrome oxide	Greenish red	Greenish yellow	Grass-green
Cobalt oxide	Pure blue	Blue	Bluish violet
Copper oxide (red oxide)	Blood-red	Purple	Purple (yellowish)
Copper oxide	Green	Sky-blue	Sky-blue (greenish)
Ferrous oxide	Greenish yellow	Bluish green	Bluish green
Iron oxide	Greenish yellow	Bottle-green	Bottle-green
Manganese oxide	Amethyst	Bluish violet	Reddish violet
Nickel oxide	Bluish violet	Amethyst	Yellowish violet
Purple precipitate of			
Cassius (gold)	Red or rose	Red or rose	Reddish blue
Uranium oxide	Topaz	Siskin-yellow	Greenish yellow
Antimony oxide	Orange (opaque)		
Selenium		Pink	Salmon color
Tin oxide	Enamel-white	White	White

R. J. MONTGOMERY

Putting the glass industry on a scientific basis. E. WARD TILLOTSON. *Chem. Met. Eng.* 23, 461-5 (1920).—A general discussion of the problems of the glass industry with the improvements which have been made, particularly by substitution of continuous and machine processes for intermittent and hand processes. Contributions of American inventors are noted and a plea is made for the scientific coöperation between the practical glass maker and the technologist necessary for adequate plant control and research.

J. S. LAIRD

Producer gas as fuel for the glass industry. F. J. DEUK. *J. Am. Ceram. Soc.* 3, 918-21 (1920).—Discussion of a paper by D.

J. S. LAIRD

Casting of pots for use in experimental work on optical glass. ALICE B. TAYLOR. *J. Soc. Glass Tech.* 4, 251-3 (1920); cf. *C. A.* 14, 3514.—Reply to discussion. In pots cast under pressure the total shrinkage after firing to 1480° is less than that of the same slip cast in the usual manner with the same proportion of alkali. The drying shrinkage is very much less. Bubbles in the base of the pots occurred only when slip below a certain viscosity was used and where the time of filling was very rapid. The appearance of the bubbles and their position indicate an encircling and entrapping of air in the mold.

by the hack wash of the slip after striking against the core of the mold. Since rapidity of rise is an asset in assuring even distribution of grog and clay enough pressure was put on to send the slip up quickly, but smoothly without splashing. It was then reduced somewhat. If a pressure of 15 to 25 lbs. per sq. in. is maintained for a considerable time, there is a tendency for the pot to crack upon the core. E. RODGERS

The effect of wet grinding, screening and electrolytes and dextrin on clays of low plasticity and strength. H. W. DONDA. *J. Am. Ceram. Soc.* 3, 885-92(1920).—Wet-grinding stoneware, semi-flint and flint clays, especially in the presence of NaOH and dextrin, increased both the air-dried strength, and strength when burned to cone 2, in some cases several hundred percent. The alkali tended to cause scumming.

J. S. LAIRD

The shrinkage, porosity and other properties of a china clay after being fired at various temperatures. Miss E. M. FURTH, F. W. HONKIN AND W. E. S. TURNER. *J. Soc. Glass Tech.* 4, 264(1920); cf. *C. A.* 14, 3514.—The material used was a typical commercial English china clay the calcd. analysis of which indicated that it consisted of 87% kaolinite, 11% orthoclase with small amts. of other minerals. The clay was made up with 49½% water to a very smooth and fairly plastic mass. The properties at various temps. were as follows:

Firing temp.	Shrinkage.	Porosity.	Apparent d.	Density of material.
100	3.30	....	....	....
200	3.32	....	....	....
350	3.38	....	....	....
500	3.61	....	....	....
600	3.92	51.5	1.20	2.46
750	4.14	52.5	1.19	2.53
900	4.48	56.2	1.14	2.56
1000	5.72	52.0	1.25	2.62
1100	10.94	45.6	1.41	2.60
1200	14.71	31.7	1.77	2.60
1300	18.72	14.5	2.19	2.56
1400	21.15	8.3	2.36	2.56
1500	22.08	2.4	2.44	2.51

E. RODGERS

A rapid method for the relative porosity determination of ceramic bodies. LÉON BERTRANN. *Céramique* 23, 77(1920); *Sprechsaal* 53, 443-444(1920).—The customary method for detg. the porosity is by the formula $(P_1 - P_0)/(P_1 - P_2)$ in which P_0 = dry wt., P_1 = wet wt. and P_2 = suspended wt. In using this method it is necessary to det. 3 wts., whereas in this new method it is only necessary to know 2 wts. In making the suspended wt. the test piece is immersed under a liquid by means of a wire. A small additional pan is attached to this wire to det. the difference between P_0 and P_1 . The test piece is attached to the wire and the scale is balanced by putting wts. on the opposite large scale pan. The test piece is then immersed in the liquid and after all absorption has ceased the scale is again balanced by putting wts. on the small scale pan. This weight equals $P_0 - P_1$. The satd. test piece is now removed from the liquid, wiped and again attached to wire and the wts. are removed from the small scale pan. The scale is again balanced by putting additional wts. on the large pan. These additional wts. equal $P_1 - P_0$. Let $p' = P_0 - P_1$ and $p'' = P_1 - P_0$. The porosity is then $p''/(p' + p'')$. For this work it is desirable to use CCl_4 because of its low surface tension. Fifteen min. was usually sufficient completely to sat. the test pieces and in no case was more than 2 hrs. necessary, whereas with water it is often necessary to soak 24 hrs.

H. G. SCHURECHT

Cone 7-9 porcelains. TH. HERTWIG-MOEHRENBACH. *Sprecksaal* 53, 363-5 (1920).—Owing to the fuel shortage cone 7-9 porcelains are being substituted for the cone 14 porcelains. Cone 7 porcelains vary in compn. between the following limits: $0.5 \text{ K}_2\text{O} \{ 1\text{Al}_2\text{O}_3 5\text{SiO}_2$ (Pukall) and $0.65 \text{ K}_2\text{O} \{ 1.97 \text{Al}_2\text{O}_3 11.88 \text{SiO}_2$ (Dorfner). $0.5 \text{CaO} \{ 1\text{Al}_2\text{O}_3 5\text{SiO}_2$ (Pukall) and $0.35 \text{CaO} \{ 1.97 \text{Al}_2\text{O}_3 11.88 \text{SiO}_2$ (Dorfner). Cone 9 porcelains vary between the following limits: (a) RO 3 Al_2O_3 14.45 SiO_2 and (b) RO 4.8 Al_2O_3 27 SiO_2 . (a) This porcelain is very pretty but not very translucent. (b) This porcelain is very translucent. In France porcelains of the (a) type are fired at cone 14, at which temp. they become very translucent. A French body which matures at cone 9 is as follows: $0.8 \text{K}_2\text{O} \{ 2.78 \text{Al}_2\text{O}_3 12.74 \text{SiO}_2$. A Thuringian mfr. makes a porcelain similar to type (b) which is fired at cone 9. Some well known Silesian and Bavarian mfrs. use the following body, which is fired at cone 9: RO 4 Al_2O_3 18.7 SiO_2 . If this body is ground for 24 hrs. at 23 r. p. m. it matures at cone 9. All German hard porcelains mature at cone 8 if ground for 100 hrs. It is obvious that the SiO_2 and Al_2O_3 contents are not as important as one may think. A body of the following compn., together with a little ZnO_2 , makes an excellent porcelain at cone 9: $0.75 \text{K}_2\text{O} \{ 3.5 \text{Al}_2\text{O}_3 18.0 \text{SiO}_2$. One body of the compn. RO 3.6 Al_2O_3 18.5 SiO_2 has a shrinkage of 10.6% at cone 9 and was found very satisfactory for doll heads. The lower the acid content the better the porcelains stand up in firing. Glazes for cone 7 and 9 are as follows:

$0.2 \text{KIO} \{ 0.2 \text{MgO} \} 0.4 \text{Al}_2\text{O}_3 3.5 \text{SiO}_2$. Cone 9 $0.2 \text{MgO} \{ 0.5 \text{Al}_2\text{O}_3 4 \text{SiO}_2$. Both of $0.6 \text{CaO} \{ 0.6 \text{CaO} \}$

these glazes develop excellent greens, which is impossible with cone 13 glazes. In firing colored glazes it is important to fire under oxidizing conditions. The following

$0.4 \text{PbO} \{ 0.45 \text{CaO} \} 0.32 \text{Al}_2\text{O}_3 2.95 \text{SiO}_2$. In Thurin-
0.15 K_2O

gia the bodies are ground for 70-100 hrs. For glazing this ware hard tough glazes are required to prevent crazing. The bodies ground for 24 hrs. can be covered with softer glazes. Flint should be used in place of quartz since it is much purer. The following bodies were found very promising for cone 7 porcelains, some having a very low shrink.

1. $0.5 \text{K}_2\text{O} \{ 0.5 \text{CaO} \} 2 \text{Al}_2\text{O}_3 19 \text{SiO}_2$	9. $0.5 \text{K}_2\text{O} \{ 0.5 \text{CaO} \} 2 \text{Al}_2\text{O}_3 9 \text{SiO}_2$
2. $0.5 \text{K}_2\text{O} \{ 0.5 \text{CaO} \} 1.9 \text{Al}_2\text{O}_3 9.9 \text{SiO}_2$	10. $0.63 \text{K}_2\text{O} \{ 0.37 \text{CaO} \} 2.3 \text{Al}_2\text{O}_3 9.59 \text{SiO}_2$
3. $0.5 \text{K}_2\text{O} \{ 0.5 \text{CaO} \} 1.8 \text{Al}_2\text{O}_3 9.5 \text{SiO}_2$	11. $0.50 \text{K}_2\text{O} \{ 0.50 \text{CaO} \} 1.8 \text{Al}_2\text{O}_3 7.5 \text{SiO}_2$
4. $0.3 \text{K}_2\text{O} \{ 0.7 \text{CaO} \} 1.84 \text{Al}_2\text{O}_3 7.15 \text{SiO}_2$	12. $0.50 \text{K}_2\text{O} \{ 0.50 \text{CaO} \} 1.8 \text{Al}_2\text{O}_3 8.48 \text{SiO}_2$
5. $0.65 \text{K}_2\text{O} \{ 0.35 \text{CaO} \} 2.41 \text{Al}_2\text{O}_3 9.4 \text{SiO}_2$	13. $0.65 \text{K}_2\text{O} \{ 0.35 \text{CaO} \} 2 \text{Al}_2\text{O}_3 9 \text{SiO}_2$
6. $0.50 \text{K}_2\text{O} \{ 0.50 \text{CaO} \} 1.6 \text{Al}_2\text{O}_3 8 \text{SiO}_2$	14. $0.50 \text{K}_2\text{O} \{ 0.50 \text{CaO} \} 1.6 \text{Al}_2\text{O}_3 7 \text{SiO}_2$
7. $0.50 \text{K}_2\text{O} \{ 0.50 \text{CaO} \} 1.7 \text{Al}_2\text{O}_3 8 \text{SiO}_2$	15. $0.50 \text{K}_2\text{O} \{ 0.50 \text{CaO} \} 1.5 \text{Al}_2\text{O}_3 7 \text{SiO}_2$
8. $0.50 \text{K}_2\text{O} \{ 0.50 \text{CaO} \} 1.9 \text{Al}_2\text{O}_3 8.8 \text{SiO}_2$	16. $0.50 \text{K}_2\text{O} \{ 0.50 \text{CaO} \} 2 \text{Al}_2\text{O}_3 11 \text{SiO}_2$

H. G. SCHMIDT

Firing hard porcelain with wood gas. M. LARCHEVÉQUE. *Céramique* 23, 73-7 (1920); *Keram. Rundschau* 28, 389-390, 401-402 (1920).—It was easy to reach the necessary temp. and porcelain as well as other ceramic wares can be fired with wood gas. Wood gas has the advantage that it contains no S and ashes and hence most of the ware may be set in the open fire. The best woods for this purpose are oak, birch and beech.

H. G. SCHURECK

The testing of chemical porcelain in England. J. GR. *Keram. Rundschau* 28, 470-471 (1920).—To det. defects the ware is soaked in 5% eosin soln. for 18 hrs. By this means defects such as crazing, pinholes, porous bodies, etc., can be detected. The vessel is then washed in HCl and dried. Its resistance to sudden temp. changes is then measured. This is done by heating the vessel with Bunsen burner, removing from the flame with a cold pair of tongs and placing on a cold porcelain triangle 6 times. The ware is then soaked for 12 hrs. in eosin soln. and examd. for defects. If no defects appear the vessel is subjected to 6 more heats. The resistance to high temps. is measured by heating to 950° at which temp. the glaze should show no signs of blistering or running. In the cleaning and wet heating test a dry vessel is heated to redness, cooled and weighed. It is put in hot dil. acid (1:1 HCl) for 12 hrs. It is then washed, dried with a towel and immediately put over a burner and heated to redness. Upon cooling the wt. should be the same as it was originally and the vessel should show no defects after soaking in eosin soln. To test the resistance to acids and alkalies the weighed vessel is filled with concd. HCl and heated over a water bath for 4 hrs. It is then reweighed. This same treatment is repeated, using a 5% Na_2CO_3 soln. and a 5% NaOH soln. To test roughly the lead content in the glaze a drop of HF is applied to the glazed surface. The acid is evapd. by placing the dish over a steam bath and is then covered with a drop of H_2SO_4 . A brown or black spot indicates lead, copper, etc., and should not appear on first-class ware. Lead or other reducible oxides may be also detected by heating to redness and passing a stream of H over the ware. If reducible the glaze will darken. H. G. S.

The rate of vitrification of porcelain molded under different conditions. R. F. SHERWOOD. *J. Am. Ceram. Soc.* 3, 837-41 (1920).—A porcelain body was made into briquets by casting, by pressing in the plastic state, and by dry-pressing in a steel mold at pressures of 2000, 4000 and 6000 lbs. per sq. in. In the air-dried state the densest body was produced by pressing at 6000 lbs., followed by the casting process, dry-pressing at lower pressures and molding in the plastic state. On firing in a draw-trial kiln the plastic body showed the most rapid decrease in porosity, followed by the cast and dry-pressed bodies. Minimum porosity was reached by the plastic and cast bodies at a temperature about 40° lower than for the dry-pressed bodies. J. S. LAIRD

Porcelain insulator progress during 1920. H. J. RYAN. *Elec. World* 77, 30-2 (1921).

C. G. F.

A vermillion color from uranium. C. F. BINNS AND F. LYTTLE. *J. Am. Ceram. Soc.* 3, 913-4 (1920).—A glaze of approx. the mixt. 57 Pb_3O_4 , 20 feldspar, 2 ZnO , 12 flint, 9 U_3O_8 gave a bright vermillion color at cone 04. J. S. LAIRD

Artificial versus natural draft in down-draft periodic kilns. A. STAUDT. *J. Am. Ceram. Soc.* 3, 915 (1920).—Uniform forced draft would aid in obtaining uniform burns.

J. S. LAIRD

Oil firing of kilns. F. A. WHITAKER. *J. Am. Ceram. Soc.* 3, 842-6 (1920).—Expts. were tried on firing chemical stoneware with oil in an open-fire down-draft kiln. It was found difficult to obtain uniform temps., but there was no difficulty in salt-glazing the ware. In the discussion it was noted that using superheated high-pressure steam to atomize the oil and introducing air under the grates gave the best results as regards avoiding excessive temps. in the firebox and uniform temps. in the kiln. J. S. LAIRD

The construction of a novel testing furnace. S. F. WALTON. *J. Am. Ceram. Soc.* 3, 833-6 (1920).—Description of a muffle type, down-draft pot furnace used for testing

the strength of *refractories* at high temps. The load was applied to the test piece set on knife edges, by means of a pivoted beam whose outer end is raised by means of a jack counterpoised on a platform scale. Load was applied at a rate of 80 lbs. per minute until failure occurred.

J. S. LAIRD

Strength of refractories at different temperatures. V. BODIN. *Céramique* 23, 177-184 (1920).—The strengths of refractories at different temps. were measured on $\frac{1}{4}$ " cubes heated in a gas furnace. It was found that for fire clay, bauxite, corundum, carborundum, silica and zirconia refractories the crushing strength decreases with an increase in temp. up to about 800° . Above this temp. the strength increases rapidly with an increase in temp. until about 1000° is reached, after which the strength again decreases with an increase in temp. With magnesite and chrome refractories the strength decreases with an increase in furnace temp., showing no increase in strength at 1000° . For example, a bauxite having the following chem. analysis was fired at 1300° and 1500° and then tested at different temps.: SiO_2 13.3, TiO_2 3.35, Al_2O_3 61.05, Fe_2O_3 4.75, CaO 0.95, MgO 0.10, and loss on ignition 16.45 %:

Temp. ° C.	Kilograms per cm^2 .	
	Bauxite fired at 1300° .	Bauxite fired at 1500° .
20	395	680
600	300	380
700	285	350
800	270 minimum	360 minimum
900	350	570
1000	715 maximum	685 maximum
1100	330	500
1200	120	280
1300	55	95
1400	30	40
1500	15	15

Tests made on other refractories gave the following results:

Type.	Compression strength kgs./ cm^2 .				
	20°.	800°.	1000°.	1300°.	1500°.
Fire clay A.....	195	125	105	740	40
Fire clay C L.....	920	555	575	360	65
Fire clay P.....	1110	485	1755	115	20
Corundum.....	790	530	615	310	30
Carborundum.....	415	425	585	150	70
Silica brick S.....	180	90	80	60	40
Silica brick V.....	240	125	185	160	100
Fused quartz.....	2550	1040	780	1670	100
Zircon.....	395	275	345	90	10
Magnesite.....	450	205	190	155	30
Chrome.....	450	450	425	215	75

H. G. SCHURECHT

Refractories for electric furnaces. ANON. *Mineral Foote Notes* Sept.-Oct. 3-7 (1920).—Elec. furnaces may be roughly divided into two classes, namely, those for ferrous and those for non-ferrous metals. For ferrous melting the arc furnace in its various modifications is in general use. In non-ferrous industries, arc, radiation and induction furnaces are in use. The non-ferrous furnaces are low-temp. units when compared with those used in the ferrous industries since the aim in non-ferrous furnaces is to work at minimum temps. so as to avoid volatilization losses. Furthermore non-ferrous furnaces are intended for melting only, whereas ferrous furnaces are intended for refining as well as melting, which means a more vigorous slag action on the re-

refractories. Some special requirements for elec.-furnace refractories are the following: (1) The m. p. should be between 1700° and 1750°. (2) They should be very resistant to sudden temp. changes, since a heat is often completed 2 hrs. after starting from the cold. (3) The refractories should not change in vol. at elec.-furnace temps. Bricks often shrink considerably when fired at the higher elec. furnace temps. (4) The bricks should be very resistant to corrosion since oxidizing and reducing slags are often present and these, together with the high temps., cause vigorous corrosion of the refractories. (5) Where a circulating metal bath is used as in induction furnaces the refractories should be very resistant to abrasion. Different parts of the furnaces must meet the following requirements: (a) The outer walls should be a good heat insulator and moderately refractory; (b) the hearth should have a high melting point, be inert towards slags and be resistant to erosion; (c) the roof should be resistant to slags and fumes, should have no tendency to spall and have a high melting point. The present practice is to use a good grade of fire brick for the outer wall, this sometimes being laid next to siloel, asbestos or a similar insulator. Magnesite bricks are laid against the fire brick for forming the inner side walls of the furnace, and one or two courses are laid over the bottom layer of fire brick. The rammed-in or built-up hearth is then made with lead-burned magnesite, dolomite or "syndolag." The roof is most frequently made of silica brick, although carborundum and electrically fused magnesite have also been used. The refractories now used in elec. furnaces fail to meet the requirements. It is suggested that zirkite may be an excellent refractory for elec. furnaces since it meets most of the above requirements.

H. G. SCHUERCH

Requirements of quartz brick and mortar in England. ANON. *Keram. Rundschau* 28, 402-403 (1920).—The brick should contain not less than 94% SiO_2 nor more than 2% CaO . The fusion should be cone 30 or better. Upon heating to cone 12 the brick should not show an expansion greater than 0.75%. The quartz mortar should be finely ground and contain not less than 92% SiO_2 and fuse at a temp. equal to that of the brick.

H. G. SCHUERCH

Heat transmission of brick and high-temperature insulating materials. R. A. HORNING. *J. Am. Ceram. Soc.* 3, 865-76 (1920).—Description of app. of the "hot-plate" type used in measuring the heat transmission of refractories, etc. The material under test is placed between a heating coil and two water-cooled plates. The temp. of the two sides of the material is measured by thermocouples, and also the elec. energy from the coil through the material, dissipated, for this temp. difference. To avoid edge losses only the central one-ninth of the area is included in the calcns. By using a modified app. with 3 heating coils, the material under test between the coils can be held with a definite temp. difference between the two sides up to 1500° F. for the hotter side. A table is given showing the heat transmission for a number of refractory and insulating materials up to 1500° F. One difficulty about the method is the time required for establishing equil. in the material under test.

J. S. LAIRD

United States patents relating to enamels with special reference to enamels for iron and steel. C. J. WEST. *J. Am. Ceram. Soc.* 3, 893-9 (1920). J. S. LAIRD

The use of zinc sulfide for white and luminous enamels. J. SCHAFER. *Keram. Rundschau* 27, 29-35 (1919).—Owing to the high cost of SnO_2 as an opacifier for enamel, substitutes for this are important. The use of ZnS (German patent 289,817) has attracted considerable attention because it is comparatively cheap. A series of experiments was run to det. whether ZnS or ZnO produced opacity in enamels. A very fusible enamel was used containing about 5% cryolite and the enamel was fired at 800°. In Expt. 1 5% ZnS and 6% clay were added to the mill. An opaque glaze was obtained with a yellowish tinge, probably due to the Fe in the sulfide. In Expt. 2 4.1% ZnO and 6% clay were added. This enamel did not cover well, showing that ZnS and not ZnO is necessary to produce opacity. Another series of expts. showed that ZnS is not

destroyed in less fusible glazes unless certain metals which have a strong affinity for Zn are present. The more refractory enamels containing ZnS however are not as glossy as the same containing SnO_2 . A number of patents have been granted for making luminous enamels with luminous ZnS since the chem. comp. is not very different from that of pure ZnS. Luminous ZnS (*i. e.*, radioactive ZnS) has been used for some time with transparent varnish for various instruments. The disadvantage of using varnish as a binder is that the radioactivity of the paint has only a short life, being practically gone at the end of 3 yrs. whereas luminous enamels would probably last 10 yrs. It is necessary that 40-50% luminous ZnS be added to an enamel to produce sufficient luminosity in the dark and for this purpose very fusible enamel seems best suited. Enamels containing ZnS cannot be used to make colored enamels since the coloring oxide would combine with the ZnS producing poor colors. H. G. SCHURECK

Surface creepage and high-voltage insulation (NISHI) 4.

Treating clays. W. SMITH. Brit. 149,440, May 13, 1919. In the production of articles and materials from clay, the clay is heated together with a material containing volatile C compds., such as bituminous or oil shale, with the exclusion of air, the excess C being left within the mass of the article. The clay may be impregnated with volatile C compds., or the bisected articles may be charged with gaseous or liquid carbonaceous compds., and heated with the exclusion of air. The firing may be effected by embedding the clay article in powdered coke or oil shale, and the temp. used may be sufficient to seal up the C in the clay. The carbonized clay may be treated with clay slips, glazes, or enamels. Abrasives may be formed by satg. clay with C as above, heating to a very high temp., say 1600°, and grinding the material.

20—CEMENT AND OTHER BUILDING MATERIALS

C. N. WILEY

Portland cement specifications. ANON. *Brit. Clayworker* 29, 27 (1920).—Brit. standard specifications for portland cement, Report 12, 1920, contains a number of important modifications. (1) A paragraph has been inserted making clear that no cement to which slag has been added, or which is a mixt. of portland cement and slag will comply with the specifications. (2) Provision has been made for sampling cement, when stored in deep silos. (3) The sp. gr. test has been eliminated. (4) The aeration of cement before testing for setting time has been dispensed with. (5) A provision has been inserted permitting the deduction from the total lime content of the proportion of lime necessary to combine with the SO_3 present when calcg. the lime ratio. (6) The medium and slow-setting cements have been replaced by a grade having a minimum initial setting time of 20 mins., and a max. final setting time of 10 hrs. A minimum final setting time is not now specified. (7) The clause relating to the supply by the vendor, free of cost, of a certificate that the cement has been tested and analyzed and complies in all respects with the specifications, has been modified to provide that if such a certificate is required it must be so specified at the time of purchase. It is stipulated that samples for testing are to be taken from 12 different positions of a heap or from 12 different bags. Six tests are required to be carried out whose results should comply with the following conditions: (a) **Fineness:** 100 g. are sifted for 15 mins. on each of the following sieves: (1) 180×180 mesh, to leave a residue not to exceed 14%. (2) 76×76 mesh, with not more than 1% residue. (b) **Chemical analysis:** Insol. residue not to exceed 1.5%; magnesia, 3%; and total S calculated as SO_3 , 2.75%. The total loss on ignition to be less than 3%. (c) **Tensile strength (neat cement):** Test briquets to be kept damp for 24 hrs. after gaging, after which they are to be removed from molds

and submerged in fresh water at a temp. of 58° - 64° . Six briquets to be tested for breaking strength at 7 and 28 days, resp. After 7 days breaking strength not to be less than 450 lbs. per sq. in. section, and an increase to be shown at 28 days, and not to be less than that calcd. by the following formula: Breaking strength at 7 days + 40,000/ breaking strength at 7 days. (d) *Tensile strength (cement and sand)*: Briquets to be in proportion of 1 part of cement to 3 parts of standard sand, each by weight. Conditions for setting are the same as for neat cement. Breaking strength at the end of 7 days to be not less than 200 lbs. per sq. in. section. For 28 days breaking strength to comply with conditions similar to neat cement. (e) *Setting time*: Initial setting time to be not less than 20 mins. and final setting time no more than 10 hrs. These times are to be detd. by Vicat needle app. (f) *Soundness*: This is to be tested for by the Le Chatelier method. The expansion is not to exceed 10 mm. after 24 hrs. treatment. After 7 days it shall not exceed 5 mm.

H. G. SCHURECHT

The popping (unsoundness) of lime plaster. W. E. EMLEY AND C. H. BACON. *J. Am. Ceram. Soc.* 3, 877-84 (1920).—In order to test the tendency of impurities in limes to "pop" when made into plaster, test specimens were made of two coats, the first of 1 part lime to 4 parts sand, the second 3 parts lime to 1 part calcined gypsum, and exposed to air for 15 months. It was concluded that popping is caused by grains of material which slowly hydrate and expand. This material may be a compd. of lime and silica, alumina, or iron, or incompletely oxidized iron compds. The sand used may cause popping if it contains coarse particles of magnetite or ferrous carbonate. Particles in lime fine enough to pass a No. 48 screen will not cause popping if the lime is soaked overnight before use.

J. S. LAIRD

Surface area of sand determined by volume-moisture relation. R. B. YOUNG AND W. D. WALCOTT. *Eng. World* 17, 243-45 (1920).—Surface area is detd. by the formula $A = 236.1\sqrt{S}/n$ where A = surface area in sq. ft. per 100 lbs., S = sp. gr. of the sand, and n = no. of grains per g. in any size of sieve sepn. The max. % increase in vol. or bulking due to wetting is related to the surface area by the equation $A = 40.6 x + 180$ where A = surface area in sq. ft. per 100 lbs. and x = max. increase in vol. in %.

J. A. MONTGOMERY

Price of sodium fluoride discourages its use as preservative. ANON. *Rail. Main. Eng.* 16, 338-9 (1920).—Data collected by Forest Products Lab. give strong evidence of the value of NaF as a preservative. The present cost is nearly double that of ZnCl₂. The reduction of cost of manuf. of NaF to that of ZnCl₂ is improbable under present conditions.

R. C. B.

Making wood fire-resistant with paint. ANON. *Rail. Main. Eng.* 16, 344-9 (1920).—Fire-retardant paints are the most practical means so far discovered by the Forest Products Lab. for making small aunts. of wood fire-resistant. Ordinary calcimine or whitewash is good. For exterior paints a mixt. of linseed oil, zinc borate, and chrome green has proved effective.

R. C. B.

Report on the use of treated ties. ANON. *Rail. Main. Eng.* 16, 391-410 (1920).—The report of the committee on ties to the Roadmasters and Maint. of Way Assoc. is given. Treated ties are recommended. Av. life of ties is: For creosote treatment, short-leaf pine 12 yrs.; long-leaf loblolly 18 yrs.; red oak 16 yrs.; for ZnCl₂ treatment, short-leaf pine 10 yrs.; red oak 16 yrs.; untreated red oak 4 yrs.; short-leaf 5 yrs.; for long-leaf 10 yrs.

R. C. B.

Hydraulic cement and alkali from natural silicates. E. W. JUNGNER. U. S. 1,357,873, Nov. 2. Liberation and volatilization of alkali on heating a mixt. of lime and feldspar or similar mineral substances is facilitated by adding to the charge about 4% or more of carbonaceous material such as coal, charcoal or sawdust, in finely divided condition. On heating the materials to 1250 - 1450° , K₂CO₃ is volatilized and a cementi-

tious residue obtained. No Ca salts of inorg. acids are used (except CaCO_3 which is converted into lime in the initial stage of heating of the charge).

Slag cements. R. BOVEROULLE. Brit. 149,988, Aug. 9, 1920. In making cement from slag by the cold process, lime dross, consisting of the residue of the lime which has passed through the grids beneath the kilns, together with ashes of the fuel employed, is mixed with granulated slag.

Rotary kiln for sintering cement slurry, etc. A. LARSEN. U. S. 1,358,759, Nov. 16.

Rotary kiln for sintering cement slurry, etc. A. LARSEN. U. S. 1,358,760, Nov. 16.

Rotary kiln for sintering cement slurry, etc. A. LARSEN. U. S. 1,358,761, Nov. 16.

Coated floor-covering fabric. A. C. HOLZAPPFEL. U. S. 1,358,371, Nov. 9. A flooring covering is formed of a flexible hacking fabric such as canvas coated with a mixt. of stearin pitch or palm oil pitch 57, a finely divided inert filler such as infusorial earth 8 and halsamwood sawdust or other fibrous material 16 parts. Coloring materials, asphalt or vegetable gums may be added.

Sound-absorbing material for walls, floors and ceilings. W. C. SABINE and R. GUASTAVINO. U. S. reissue 14,992, Nov. 23. See original pat. No. 1,197,956; C. A. 10, 2978. Particles of a body material such as sand or pumice, graded to approx. uniform size are united by a cementing material such as portland cement so as to leave intercommunicating channels between the particles.

Sound-absorbing and heat-insulating material. J. COMERA. U. S. 1,358,830, Nov. 16. A sound-absorbing and heat-insulating material adapted for use in walls or floors is formed of cork granules interspersed through and sepd. from each other by cement and hair felt.

Heat-insulating coverings. J. A. BEATON. Brit. 149,789, May 26, 1919. An insulating covering for floors, walls, bulkheads, etc., comprises a layer of agglomerated cork, covered with a metallic reinforcement to which is directly applied a facing of water-proof cement. The cork compn. consists preferably of three cu. ft. of cork of a quarter-inch grade, one cu. ft. of cement, and one and a quarter lbs. of granulated soda. A layer of this compn. is covered with expanded metal or the like, and a facing composed of 5 cu. ft. of granite, 4 cu. ft. of cement, and a gallon of a waterproofing compn. such as that described in 25,833, 1908 and known as "Prufit" or "Ceresit" is applied directly to the reinforcement.

21—FUELS, GAS, TAR AND COKE

J. D. PENNOCK

The constitution of the humic acids. WILHELM SCHNEIDER AND ALBERT SCHELLENBERG. Mülheim. *Brennstoff Chem.* 1, 73 (1920).—(Cf. Popp, C. A. 15, 372). When NaOH soln. acts on peat at room temp., practically no H₂O-sol. acids are formed, but at higher temps. (250°) the quantity may reach 50%. Investigation of the sol. acids is being undertaken. The authors doubt that Popp's *humic acid* is to be regarded as a single substance. W. B. V.

Technical peat-moor problems. G. KEPPELER. Hannover. *Brennstoff Chem.* 1, 41-2 (1920).—A review of the com. processes of peat utilization. W. B. V.

Applications of electrical power in modern gas undertakings. H. C. WIDLAKE. J. (Brit.) *Inst. Elec. Eng.* 58, 704-18 (1920). C. G. F.

Overvaluation and undervaluation of low-temperature tar. FRANZ FISCHER. Mülheim. *Brennstoff Chem.* 1, 69 (1920).—F. warns against a general rush into the manuf. of low-temp. tar before the technical questions surrounding its utilization have been further investigated. In only a few special cases can it be utilized *per se*, and if the market is flooded with it as a raw material before the chemical and petroleum industries are ready to use it on a large scale, the industry will receive a severe setback. W. V. B.

Coal tar utilization—old and new. K. ROBAS. *Seifensieder-Ztg.* 47, 684, 697-8, 719-20, 739, 759-61, 779-80, 795-6, 835-6, 855(1920).—An extended discussion of the manuf. and uses of coal tars, exclusive of dyes, etc., and explosives. I. Coal tar and its prepn. giving the characteristics and manuf. of crude, dehydrated, distd. refined and acid-free tars, together with their application as iron-varnish, insulation of moist walls, wood cements, heat-protective roofing tar and black sealing wax. II. Artificial resins. A. *Coumarone resin*: Coumarone resins are obtained from the light oil fraction going over at 160-185°; it is air-blown cold with 5% of 24° Bé. H_2SO_4 to remove pyridine bases and pyro-resins; it is then treated with 5% of 60° Bé. H_2SO_4 , removing more resins as well as polymerizing olefins; the unchanged naphtha is then distd. off while the residue constitutes the coumarone resin and its consistency and properties depend upon the amt. of naphtha removed and the thoroughness of the preceding H_2SO_4 treatment. Coumarone resin is a mixt. of coumarone, C_9H_8O , b. 169° and indene, C_9H_8 , b. 182°, both unsatd. compds. which by polymerization become solid; they have a very low sapon. no. and therefore cannot be hardened by metallic oxides, but they emulsify with alkali in the presence of fatty compds. or rosin, and are stable toward acids and many chemicals; they oxidize in air somewhat like drying oils, but also absorb moisture. They are used in varnish manuf., etc., for printers' inks and impregnating belting made from paper. B. *Formaldehyde resins*: R. enumerates the raw materials used, the addition of other substances and discusses the contact and polymerizing agents for both sol. and insol. resins, mentioning bakelite A and B as intermediate and bakelite C as end product of the reaction. The sol. resins may be changed into insol. ones by removal of phenol or treatment with 10-20% HCl at 60-70°, while the insol. resins may be converted into sol. ones by addition of formalin. The prevention of permanent gas bubbles in the condensation of insol. resins is still a trade secret. The final operation is a wash with boiling H_2O and some neutralizing agent or a re-melting. *Solvents and lubricants*: The properties and uses of other tar products, such as benzene, halobenzenes, naphthalene, creosote oil and anthracene oil, etc., are described in more or less detail; the anthracene oil is now used again—due to shortage in petroleum products—for lubrication, but only after much refining to remove crystalline compds., resinous phenols and S. compds.

P. Escmér

Various influences on pyrolytic changes in the coke oven. A. THAU. *Oxelösund. Brennstoff-Chem.* 1, 52-8, 66-8(1920).—Small-scale coking expts. can duplicate the conditions of practice only approx., due to the very great influence of superheating on the primary products in a large oven; in the present instance several full-size ovens in a series were available for the exptl. work. A 50-mm. pipe projected several feet into the tightly closed oven, and through it the gases were aspirated in turn through a worm cooler, and excelsior tar filter, a H_2SO_4 absorber and two wash-oil absorbers, being collected finally in a gas holder. Temp. was measured in the arch of the oven. A series of expts. with Durham coal (English), at temps. ranging from 500° to 870° led to the following conclusions: At 500° and 550° the heat transmission was so slow that coking was imperfect, but the gas showed the characteristic compn., CH_4 56.4% and 52.6%, resp., H_2 22.4 and 27.6, resp. At 600° and 660° a transition begins between low-temp. and high-temp. characteristics; at 600° hard layers of coke 3-4 cm. thick were formed at the sides, but the center did not hold together. The light oil showed a ratio of 61% paraffins to 39% aromatics. At 660° this ratio had changed to 28-72%, but the aromatic fraction was only 42% benzene. The coking was nearly complete. At 710° only traces of paraffins remained in the light oil; coking was complete, but the coke was black and friable, due to the absence of carbon set free from the gases. At this temp. the NH_3 recovery rose to 5.62 kg. per 100 cu. m. of gas, and traces of naphthalene appeared in the light oil. At 750° and 800° the NH_3 continued to increase slightly, in spite of its known instability at these temps. At 800° and higher, the coke formed

was normal, but the yield of light oil began to diminish, owing to the increasing quantity of naphthalene. In an expt. at 850° the oven was only $\frac{1}{4}$ filled with coal, and the upper part of the oven was superheated; the yield of NH₃ was somewhat lessened, but also that of naphthalene, indicating that the hot surfaces of carbon are more effective in bringing about the decompns. than are the hot retort walls. In another expt. at about the same temp., the oven was freshly cemented inside and the coal was covered with a layer of fine ashes, so that there would be no hot C surfaces in the top of the oven. Results were almost identical with those of the preceding expt., indicating that this surface is negligible in comparison with that of the coke itself. The same conclusion followed from an expt. in which the upper surfaces of the retort were covered with carbon by the decompn. of a coat of hard pitch. The influence of air leaks was investigated by admitting small quantities of O₂ from a cylinder; at 820° the NH₃ and hydrocarbons were diminished appreciably and the CO₂ and N₂ rose correspondingly, so that the heat of combustion of the gas fell off by a third. The same tendencies were noted, in larger measure, at temps. up to 1010°, esp. in the case of the partly filled oven. This oxidation was apparently heightened by the presence of hot carbon surfaces. T. concludes that this observation is an important argument against the use of diminished pressure in the coke oven, since the ordinary lutes are by no means gas-tight when dry.

W. B. V.

Industrial tar melanosis (ARNSTEIN) 11H. Catalytic effects in the combustion of organic substances (v. EULER, JOSEPHSON) 2. Natural-gas gasoline in 1918 (SIEVERS 22. Fatty acids, etc. (BRIT. pat. 149,974) 10.

Atomizable fuel. L. W. BATES. Brit. 149,306, Dec. 22, 1919. A fuel consists of a suspension and a colloidal soln. of any carbonaceous particles in any liquid hydrocarbon, whereby the liquid, paste, or gel formed is mobile and may be atomized at the temp. of use, and yet is stable, that is, does not settle, for a period permitting storage and transport. The carbonaceous substance is pulverized or otherwise reduced mechanically, electrically, or chemically, until about and preferably more than 95% passes through a screen of 100 mesh to the linear inch and 85% through a screen of 200 mesh, and is then mixed with the liquid hydrocarbon by passage through a ball, tube, or paint mill, or by heating to 65-95° with or without agitation, or by a combination of these methods, or the solid may be reduced in presence of the liquid. Suitable carbonaceous substances specified are anthracite, semi-anthracite, bituminous and semi-bituminous coals, lignites, peats, anthracite culm, dust and slush, bituminous and lignite slack, screenings and dust, coal seam dust, pressure-still smelting, and gas cokes and char-coals, and wood. Suitable liquids mentioned are fuel oils, pressure-still oil or tar, coal tar from coke ovens or gas works, and molasses and liquefied solid hydrocarbons. The liquid should preferably have a viscosity of about 20° Engler at 20° and 10° and 30°. The viscosity may be increased by (1) addition of petroleum or asphaltic pitch, petroleum residues or heavy petroleums (5-10% of pitch is suitable), or (2) emulsifying the oil as with the lime-rosin product mentioned below, followed or not by repeated heating and cooling. It may be reduced by addition of kerosene, turpentine, pressure-still oil or tar, or other "cutback." The stability of the composite may be increased by any of the following methods: (1) Increasing the viscosity of the oil as above. (2) Addition of "peptizers," which reduce the apparent sp. gr. of the particles, such as coal-tar distillates, particularly creosote, naphthalene, solvent naphtha, and the "green" residual after removal of anthracene. (3) Addition of a protecting agent or "fixateur," particularly the lime-rosin product mentioned. This product may be used in liquid, paste, powder or other solid form or as grease by addition of oil. The last and preferred form is made, e. g., by saponifying 10 parts rosin by 5 parts lime slaked and suspended in 83.5

parts Texas navy oil and 1½ parts H₂O. The rosin may be replaced by balsams, turpentine and other resinous by-products, or by pine-wood pitch, and other alkali than lime may be employed. Usually such an amt. of this protector is used as will add 0.5-1.5 rosin to the fuel. (4) Preventing the tendency to "gel" formation as by addition of a little extra "fixateur," or preventing vibration or shock, or by keeping the temp. low and constant. (5) The use of two or more liquid hydrocarbons more or less immiscible, especially when one of the liquids contains solid particles, as free carbon or asphalt. (6) The addition of "fillers" preferably of lighter sp. gr. than the oil. Cellulosic hy-products such as waste from starch, corn and flour factories, wood pulp, wood dust, particularly that containing rosin, and finely divided peat and lignite are mentioned. Liquid products may be obtained containing up to 45% of carbonaceous particles, and atomizable pastes containing up to 75% solid particles. Oils and tars such as pressure-still oil containing free C and asphalt may be centrifuged to reduce the % of solids. Examples of suitable compns. are given.

Storing liquid fuel. L. W. BATES. Brit. 149,958, Aug. 5, 1920. In storing liquid fuel composed of liquid hydrocarbon and pulverized carbonaceous material, as described in 149,306 (cf. preceding abst.), in which the sp. gr. of the composite is greater than that of H₂O, the fuel is protected from fire by a layer of H₂O on the top surface.

Motor spirit. E. C. R. MARKS. Brit. 149,398, May 7, 1919. A fuel consisting of dehydrated alc., one or more light hydrocarbons, such as gasoline or kerosene, and C₂H₂, is obtained by adding a mixt. of alc. and hydrocarbon to excess of CaC₂, or by adding alc. only to the carbide and passing the C₂H₂ evolved into the hydrocarbon and afterwards mixing the two liquids. Acetone satd. with C₂H₂ may be added.

Carbonizing. J. F. WELLS. Brit. 149,773, May 19, 1919. In a continuous process for carbonizing wood, coal, peat, etc., by internal combustion, the carbonized product is withdrawn at the moment the combustion of the volatile constituents of the fuel is completed. The wood, etc., is fed to a hopper and falls into the carbonizing chamber, its descent being assisted by a reciprocating rod. The chamber is provided with an inclined grate and rotary discharge blades which dip into H₂O. The combustion products pass through a jacket surrounding the lower part of the hopper, and escape by a pipe.

Carbonizing coal or similar materials. G. W. WALLACE. U. S. 1,358,663, Nov. 9. Material undergoing coking or distn. is heated externally through the wall of a vertical cylindrical retort and volatilized products are led off through a perforated take-off pipe within and concentric with the exterior wall of the retort. Back pressure of the gases and vapors within the charge is prevented and thus formation of fissures and irregularities of the mass are avoided.

Apparatus for distilling carbonaceous materials. G. W. WALLACE. U. S. 1,358,662, Nov. 9. Coal is coked or similar distns. are effected in a vertical retort which may be cylindrical and which is provided with a vertical central perforated off-take pipe for volatilized products on which suction is maintained. The off-take pipe may be removable from the retort and may carry a horizontal flange at its lower portion on which the material undergoing distn. is supported within the retort. U. S. 1,358,664 relates to a similar app. with branch influx pipes extending from the central off-take pipe out into all portions of the charge.

Fuel briquet. L. A. KINGKINNEY. U. S. 1,359,074, Nov. 16. A mixt. formed of sulfite liquor 8 gals., gilsonite 20 lbs., and a jelly made from kelp 4 gals. is used as a binder with 2 tons of wood fiber in making fuel briquets.

Purifying gas. H. F. SMITH. U. S. 1,358,030, Nov. 9. In the removal of vapors from gases, e. g., tar from producer gas, condensation nuclei are electrically ptd. and the vapors are then condensed.

Purifying gas. H. F. SMITH. U. S. 1,358,031, Nov. 9. Impurities such as tar in producer gas are removed from gas by subjecting the gas to high-frequency induced brush elec. discharge and then passing the gas through an electrostatic pptn. field. U. S., 1,358,032 relates to an app. for carrying out this method.

Purifying gas. FARBWERKE VORM. MEISTER, LUCIUS & BRÜNING. Brit. 149,911, July 28, 1920. Coal gas or the like after the usual purifying process is passed over finely porous C or charcoal to remove the residual S compds. It is advantageous first to remove completely the H_2S . The charcoal, which is obtained by carbonizing hard woods, is placed on trays in cylinders through which the gas is passed, the cylinders having heating and cooling connections so that the condensate may be expelled by heat and the C revivified by cooling.

Ammonia from gas producers. H. KOPPERS. U. S. 1,360,117, Nov. 23. The efficiency of gas producers is stated to be increased as is also the yield of NH_3 from them by internally heating the charge by introducing a combustible gas together with steam and causing its combustion in the interior of the charge. The gas and air for the combustion are introduced in atomized jets in close proximity to each other.

Coking, etc. DRESSLER TUNNEL OVENS and C. DRESSLER. Brit. 149,086, May 14, 1919. A tunnel oven used in carbonizing, and heated on either side progressively throughout its length, is provided at the upper part with depending walls or partitions to form compartments for the withdrawal of gases from zones of different temp. A suitable construction is specified.

Coke oven. A. ROBERTS. U. S. 1,358,787, Nov. 16.

22—PETROLEUM, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

The specific heat of petroleum at different temperatures. F. W. BUSHONG AND L. L. KNIGHT. *J. Ind. Eng. Chem.* 12, 1197-1200(1920).—The app. employed was the Parr standard calorimeter charged with benzoic acid for combustion, the calorimeter fluid being the oil or other liquid under examin. Results indicate that the specific heat of the petroleum hydrocarbons including paraffin, is proportional to, or a function of, the abs. temp. Curves are also included showing the sp. heats at various temps. for paraffin, benzene, fatty esters, glycerol, Caddo petroleum and its products, Gulf Coast (Texas) petroleum and its products, Oklahoma petroleum and its products, Mexican petroleum and its products, and Russian petroleum and its products. F. W. P.

The laboratory distillation of oil shale for the determination of the available yield of crude oil and sulfate of ammonia. E. M. BAILEY. *Petroleum Times* 4, 531-2(1920).—One lb. of shale is broken up so that no piece has a thickness greater than $1/4$ in. A malleable iron tube 6' by 2" welded at one end is used as a retort. The shale is carefully poured in so that it runs down one side of the tube. In the furnace only the end of the tube containing the shale is heated and the other end, which is inclined, acts as a condenser. A glass beaker is placed under the open end and gradually increasing heat applied for 6 hrs. Yellow or brown fumes should not issue from the tube. After completion of the heating period the part of the tube acting as a condenser is also heated, and the oil driven over into the beaker. The water is then spcd. from the oil and wt. of oil in the beaker detd. If the oil is solid a hole can be cut in and the water poured off; otherwise a pipet is used in withdrawing it. A sketch of app. used to det. $(NH_4)_2SO_4$ is shown. Shale is heated to bright redness for 1.5 hrs. in a current of steam. The vapors are conducted into dil. H_2SO_4 . After completion of the distn. the $(NH_4)_2SO_4$ is detd. by means of the nitrometer. R. R. MATTHEWS

Practical aspect of oil-yielding shale deposits of the western slope. J. B. JENSON. *Salt Lake Mining Review* 22, No. 17, 23-7(1920).—Shale deposits of the Green River

Basin, the Uintah Basin and the Debeque and Soldier Summit fields, in Colorado, Utah and Wyo., constitute the greatest deposit of oil-yielding shales in the world. J. gives a popular account of the geology of these formations. The yield of these deposits varies from a few gals. to 100 gals. per ton of shale. The Scotch retort is adaptable to shales yielding less than 35 gals. per ton, but not for higher-grade shales, owing to trouble from mass carbonization. Intense odor of shale or its free-burning qualities is not an indicator of the yield of the shale. J. suggests the word petrogen instead of kerogen for the hydrocarbon substance from which the shale oil is obtained, the word petro-shales to distinguish from oil shales in which the oil is free, and the word shalene for gasoline derived from shales.

A. H. HELLER

Natural-gas gasoline in 1918. E. G. STEVENS. U. S. Geol. Survey, *Mineral Resources of U. S., 1918*, Pt. II, pp. 1g-35g (preprint publ. Sept. 22, 1920); cf. *C. A.* 15, 303.

E. J. C.

Fractional distillation (BRIT. pat. 149,776) 13. Chlorinating hydrocarbons U. S. pat. 1,358,851) 10. Apparatus for reclaiming used automobile engine oil (U. S. pat. 1,359,814) 13.

Viscous oils. L. LILIENFELD. Brit. 149,317, May 12, 1920. Viscous fluorescent liquids of high b. p. suitable for use as lubricants, or as therapeutic or "photodynamic-sensitizing agents" are obtained by treating tar-oil fractions b. above 140°, or a hydrocarbon such as mesitylene, or pseudocumene, isolated therefrom, with gaseous C_2H_4 in the presence of $AlCl_3$, preferably under the action of heat. The oil may be sepd. by filtration or otherwise from solid matter, which is then decomposed by H_2O , and the oils obtained are freed from HCl by the addition of alkali, e. g., CaO , or the reaction mixt. may be treated with H_2O and the oil freed from acid by washing. The product is fractionated under a pressure of 20 mm. A fluorescent oil passes over between 85-260° which may be further fractionated.

Cracking hydrocarbon oils. F. PUNNING. U. S. 1,358,174, Nov. 9. In cracking petroleum oils, the oil is fed to a horizontal header from which vertical tubes depend into a chamber heated by furnace gases. The depending tubes terminate each in a rounded end in the lower part of the heating chamber and are fed with oil from the header through pipes which extend down within them and conduct oil from the header to near their lower ends. The oil undergoing cracking thus is heated in an annular space between these pipes and rises again to the header. Uniformity of heating is thus facilitated and on account of the rapid circulation through the pipes deposition of C does not soon obstruct the pipes. Drain pipes are provided from the lower ends of the heating pipes. The header is provided with a rectifying column leading to a condenser.

Apparatus and mode of operation for cracking hydrocarbon oils. R. B. DAY. U. S., 1,357,276-7, Nov. 2. The app. is designed to effect cracking and distn. of hydrocarbon oils by the action of combustion gases. The latter are generated in the lower part of a metal tower or chamber (this portion of which is lined with refractory material) and pass upwardly countercurrentwise to oil supplied through a coil of pipe in the upper portion of the tower. Oil is fractionated in the upper portion of the chamber and different fractions are separately led to different cracking zones in the lower portion of the chamber heated, resp., to the appropriate temp. for cracking the fraction involved in each case.

Apparatus for producing hydrocarbon oils from shale. R. B. DAY. U. S. 1,357,278, Nov. 2. Shale is heated in a vertical tower by intensely hot combustion gases which pass upwardly through the shale. Light vapors are led off from an outlet near the top of the tower to a condenser. Heavier fractions of distillate are collected in troughs vertically spaced from each other and extending around the wall of the tower within

its upper portion and are led back to a lower zone of the tower where a temp. is maintained which is capable of cracking them into lighter products.

Furnace for cracking hydrocarbons in the vapor phase. C. C. STUTZ. U. S. 1,359,931, Nov. 23.

Oil-gas-producing apparatus. H. J. KOTSCHEVAR. U. S. 1,357,998, Nov. 9. Gas is made from oil in the app. by heating the oil with molten metal such as Ph; e. g., gas may be thus made from kerosene at a temp. of about 550–750°.

Paraffin wax, etc. DEUTSCHE ERDÖL AKT.-GES. Brit. 149,347, July 21, 1920. Solid hydrocarbons are sep'd. from those that are liquid, particularly paraffin wax from brown coal tar, by treating the mixt., liquefied by heat, in countercurrent with a solvent that leaves undissolved the hydrocarbons solid at ordinary temps., but dissolves those that are liquid. Solvents specified are methyl, ethyl, or other alc., ethers, ketones, esters, e. g., of acetic acid, glacial acetic or other acid, and mixts. as of alc. and ether.

23—CELLULOSE AND PAPER

A. D. LITTLE

The fuel question in the cellulose industry. G. SUNDBLAD. *Svensk Pappers-Tidning* 23, 375 (1920).—S. reviews various devices designed to reduce the amt. of fuel needed for power, for digesting, for drying and for heating in the cellulose industries during 1900 to 1922. Figures for each 5 years show a regular decrease in the amt. of fuel needed in the sulfite and sulfate plants. W. SEGERBLOM

Sulfite cellulose. A. KLEIN. *Svensk Pappers-Tidning* 23, 358 (1920).—Résumé of work of different investigators on making sulfite cellulose, showing great variation in results according to different methods. Much depends upon the time of year the wood is cut, locality, thickness of year's growth ring, distance from the roots, and whether the outer or inner layers are used. W. SEGERBLOM

Cymene as a by-product in the sulfite process. O. ASCHAN. *Zellstoffchem. Abhandlungen* 1, No. 3, 73–6 (1920); *Papierfabr.* 18, 920.—Hintikka observed that 2-cymenesulfonic acid, upon treatment with concd. HNO_3 , yields *p*-nitrotoluene-*o*-sulfonic acid, with the splitting off of the isopropyl group, from which true azo dyes can be prep'd. Upon nitrating under definite conditions, 2,6-dinitrocymene is formed, besides 2,4-dinitrotoluene, which upon further nitration yields trinitrotoluene. Upon reduction the corresponding amine may be prep'd. Cymenesulfonic acid may also serve for the prepn. of thymol and carvacrol. The cymene yield is calcd. to be 1 kg. per ton of pulp. In the sulfite process it is obtained 90–95% pure. C. J. WEST

Lignin determination in lignified fibers. P. WAENTIG AND E. KERENYI. *Zellstoffchem. Abhandlungen* 1, No. 3, 65–71 (1920); *Papierfabr.* 18, 920.—Ten g. of dry-ground material, from which the fat has been extd. with $\text{C}_6\text{H}_5\text{EtOH}$, are digested with 120 cc. concd. HCl (d. 1.19) and cooled while HCl gas is passed through for 1.5 hrs. The reaction flask is then stoppered and allowed to stand for 18 hrs., after which it is opened and heated at 30° for 3 hrs. The hydrolysis with H_2SO_4 is less suitable, because the lignin is probably considerably changed. The phloroglucinol method is not suitable for lignin detns. for pure lignin absorbs very little phloroglucinol. The lignin value calcd. from the Me no. is too high. The indirect detn. of lignin by Cross and Bevan's method is open to objections in that besides chlorination a slight oxidation occurs. The approx. detn. of lignin may be carried out as follows: A weighed, thoroughly moistened sample in a tared chlorination flask, is treated for 5–6 hrs. with a slow stream of Cl. The excess of Cl is removed with a slow stream of dry air and the app. again weighed. The increase in wt. in % is the Cl no. This, divided by 140 (the av. Cl no. of lignin) and multiplied by 100 gives the approx. lignin content of the raw material. C. J. WEST

Determination of the degree of digestion of sulfite pulp. R. SIEBER. *Zellstoffchem. Abhandlungen* 1, No. 3, 53-65 (1920); *Papierfabr.* 28, 920.—Five g. dry pulp, or 21 g. well pressed moist pulp, are covered with 150 cc. distd. H₂O in a 750-cc. powder flask with a ground stopper, mixed thoroughly and allowed to stand 0.5 hr. (the standing is not necessary with moist pulp). Then 100 cc. of a bleaching powder soln. (6% active Cl, calcd. upon pulp) are added. After 1 hr. the contents of the flask are filtered and the Cl content of the filtrate (50 cc.) is detd. The method gives relative values only, and is suitable for factory control.

C. J. West

Fermentable sugars from cellulose (U. S. pat. 1,358,898) 16.

WITHAM, G. S.: *Modern Pulp and Paper Making. A Practical Treatise.* The Chemical Catalog Co., Inc., N. Y. 559 pp.

Cellulose esters. P. E. C. GORSEDET. U. S. 1,357,450, Nov. 2. Dried cotton cellulose is heated with 3 times its wt. of phenyl isocyanate or other aliphatic or aromatic isocyanate to produce a colloidal soln. from which the resulting cellulose ester may be easily isolated. Cf. *C. A.* 14, 122.

Compositions containing cellulose ethers. H. T. CLARKE. U. S. 1,357,614, Nov. 2. Ethyl cellulose ether mixts. suitable for molding, manuf. of films or varnishes are prepd. by use of sulfones such as normal dibutyl sulfone, diisobutyl sulfone, dimethyl or diethyl sulfone, normal dipropyl sulfone, diisopropyl sulfone, diisoamyl sulfone, Me-Et sulfone, diheptyl sulfone, Et-isoamyl sulfone or diphenyl sulfone, together with solvents such as CHCl₃-alc. mixt. or C₂H₅-alc. mixt. Flexible films may be thus formed which are not affected by photographic chemicals.

Cellulose ethers. L. LILIENFELD. Brit. 149,320, May 17, 1920. The more highly alkylated ethyl, methyl, benzyl and other alkyl ethers of carbohydrates of the general formula C_nH₁₀O_n, such as cellulose, starch, dextrin, lichenin, and inulin, are prepd. from the lower alkylated ethers by further alkylation in the absence of H₂O or in the presence of only moderate amts. of H₂O. For the further alkylation a large excess of alkali is not required, and a quantity calcd. on the amt. of alkylating agent present is sufficient; an excess of alkali may, however, be employed, in which case the amt. of alkylating agent required is less than that necessary when considerable quantities of H₂O are present. The products obtained are distinguished by their resistance to cold H₂O and by their solv. in a large number of volatile solvents. The lower alkylated ethers may first be isolated from the primary alkylating mixts., as, e. g., by pptn. with hot H₂O, alc., alc.-ether, or acetone; or the further alkylation may be carried out in the primary alkylating mixt. after complete or partial removal of the excess of H₂O; and if only a small excess of alkali is to be employed this may be incorporated in the mixt. before the H₂O is driven off, provided that care is taken, as by the use of a low temp., not to damage the ether. The removal of the H₂O may be effected at atm. or reduced pressure, with or without heating, and it is facilitated by energetic stirring or kneading; depending on the proportion of H₂O driven off, a paste or powdery mass is obtained. For the further alkylation, the finely divided or pasty material is mixed if necessary with an additional quantity of alkali hydroxidé, added at once or in small quantities; the alkylating agent is added and the mixt. heated, or it is added slowly with heating; the ether is sepd. by the addition of H₂O, acidified if necessary, collected, washed with dil. acid if necessary and then with H₂O, and dried. By-products such as alcs., ethers, etc., may be distd. off during or after the alkylation, or may be recovered from the alkylating mixt. either by steam distn. or by extn. with suitable solvents. In an example the prepn. of an ethyl ether of cellulose is described in which

a viscose or an alkali- or hydro-cellulose and diethyl sulfate are the primary reacting materials.

Alkali cellulose. L. LILIENTHAL. Brit. 149,318, May 13, 1920. Alkali cellulose containing little H₂O and an excess of ca. stic alkali is prep'd. by impregnating cellulose or cellulose-containing materials with caustic alkali lye or with H₂O, drying as far as possible by pressing or by treatment in suction app. or a centrifuge, etc., and then mixing with solid caustic alkali preferably in the form of powder or with a highly concd. caustic alkali lye. The powdered caustic alkali may be added in one portion or gradually, and with constant stirring, kneading, shredding, etc., and if necessary with cooling; and the dried material before the addition of the alkali may be finely divided, for instance in a willowing machine, edge runner or shredder, also advantageously with cooling.

Removing air from viscose, etc. B. BORZYKOWSKI. U. S. 1,357,946, Nov. 9. An air-free mass of viscose or similar material suitable for the manuf. of artificial threads or films is formed by prep'g. the mass with an excess of an inert volatile solvent such as ether, filtering the mixt. and then exposing it in thin layers in a vacuum chamber. U. S., 1,357,947 relates to an app. for carrying out this treatment.

Artificial threads, films, etc. B. BORZYKOWSKI. Brit. 149,296, July 16, 1920. Fluid masses or solns. to be used for the manuf. of artificial threads, films, etc., more particularly solns. of viscose and CuO-NH₃-cellulose, are freed from air and excess of volatile solvent by allowing the soln. to flow as a film over a surface contained in a hermetically sealed vessel, and in this condition subjecting it to the action of a vacuum; contact of air-free soln. with air during its passage to the spinning nozzles is avoided by exhausting the filter, pipes, spinning tube, etc. By sepg. air, etc., from the soln. the formation of air bubbles and other difficulties connected with the appearance, strength and coagulation of the thread, film, etc., are avoided. To facilitate the handling and filtering of the soln., there may be added an excess of an indifferent volatile solvent, the excess being afterwards removed during the vacuum treatment, and recovered. A suitable construction is specified.

Nitrocellulose composition for sheets and films. J. M. KRESSLER. U. S. 1,357,876, Nov. 2. Strong flexible sheets or films of nitrocellulose compn. are made by the use as a softening agent, instead of camphor, of an ester of an acyl deriv. of one of the higher fatty acids. Among the esters which may be employed are the alkyl esters of mono-, di- or tri-acetyloxy stearic acid and the alkyl esters of acetyloxyoleic acid. The Me and Et esters are preferred, although the glycerol esters have the advantage that they are more readily obtained when produced by acetylation of glycerides by the use of Ac₂O. A suitable compn. may be formed by kneading a mixt. of dry nitrocellulose 100 with methyl acetylricinoleate 32 and denatured alc. 60-70 parts at a temp. of 40-55° and then treating the mixt. to the usual operations such as rolling, pressing and seasoning. Stabilizers such as urea may be added, and pigments may be incorporated, during the rolling operation. A very flexible film such as is adapted for the manuf. of artificial leather may be formed of nitrocellulose 10, ethyl acetylricinoleate 10-15, EtOAc 40 and C₆H₆ 60 parts. The proportions of volatile solvents in this mixt. may be varied to obtain a material of the desired viscosity and the EtOAc may be replaced by butyl or amyl acetate. Coating solns. also may be prep'd. by using other volatile solvents such as MeOH, EtOH or acetone.

Fiber boards. T. B. MUNROE. Brit. 149,683, July 3, 1920. Boards are made by passing a reinforcing foraminous material such as wire netting through a tank containing a fibrous pulp comprising several different kinds of fibers such as thick fibers, finer fibers, hair-like fibers, and short fibers such as are used in paper making and causing the fibers to felt on to the reinforcing material preferably in the manner described in 141,012 (C. A. 14, 2263). The board is waterproofed by adding to the

pulp a resin size and $\text{Al}_2(\text{SO}_4)_3$. After the felting process the surplus H_2O is dried out. The boards may be treated with ferrous oxalate or other suitable substance to render them fireproof.

Molded substitute for wood. T. B. MOHLER and O. LUDRICKENS. U. S. 1,357,647, Nov. 2. A pulp formed of straw which has been boiled with NaOH soln. is mixed with fermented barley liquor and a small amt. of ptd. Fe carbonate and the mixt. is molded and baked. The product may be planed or sawed like wood and will hold nails or screws. Paper pulp may be used instead of straw pulp to produce a similar material.

Binder for colors in printing wallpaper. C. J. HEIDORF. U. S. 1,358,151, Nov. 9. A compn. for use as a binder in printing wallpaper is formed of H_2O 3 gals., kerosene 2 qts., boiled linseed oil 1 qt., soap powder 1.5 lbs., and tapioca flour 2 lbs., mixed together cold and then boiled until the mixt. becomes pasty.

24—EXPLOSIVES AND EXPLOSIONS

C. E. MUNROE

Nitrotoluenes. V. Binary systems of *o*-nitrotoluene and another nitrotoluene. JAMES M. BELL, EDWARD B. CORDON, FLETCHER H. SPRY AND WOODFORD WHITE. *J. Ind. Eng. Chem.* 13, 59-61(1921); cf. *C. A.* 14, 174.—In this the authors record the m. p. of the metastable or α -form of ONT at -10.5° and the stable or β -ONT at -4.45° . Data are given for the 3 binary systems MNT-ONT; DNT-ONT and TNT-ONT. In one case the freezing point of the metastable form was followed right to the eutectic point. The detn. of 51.3° as the m. p. of MNT (Bell and Herty, Jr., *C. A.* 14, 347) is confirmed in a review, by Holleman, of previous work of van der Arend.

CHARLES E. MUNROE

A nitrostarch stumping powder for land clearing. JOHN SWENEHART. Coll. of Agr., Univ. of Wisconsin, *Stencil Bull.* 33, Dec. 1920, 9 pp.—Results are given of tests of a nitrostarch mixt. submitted by the Trojan Powder Co. for detonation, sensitivity to impact of rifle balls, explosion by sympathy, inflammability, resistance to moisture, effect of moisture on detonation and efficiency in use, effect of temp. and toxic effect. Tables of data from the use of this explosive, and that of 20% ammonia dynamite are given with the statement that "no definite inference should be made other than that the nitrostarch explosive gives comparatively effective results. More data would be necessary to justify a statement of comparative strengths."

CHARLES E. MUNROE

Sparks from steam shovels and locomotives as causes of premature explosions. SPENCER P. HOWELL AND J. E. CRAWSHAW. Bur. of Mines, *Repts. of Investigations*, Ser. No. 2187, Nov. 1920, 2 pp.—Apropos of an explosion, Aug. 1920, of a 100-ft. drill hole loaded with 1000 lbs. of high-grade dynamite in a limestone quarry caused by a spark from a steam shovel the circumstances of this and 5 other explosions from similar causes are rehearsed and 7 recommendations as to means for the prevention of such occurrences are given.

CHARLES E. MUNROE

Dust explosions in flour bins. DAVID J. PRICE. *Am. Miller* 48, 1290(1920).—Describes an explosion which occurred Dec. 6, 1919, at Boissevain, Man., due to one of the employees "striking" a match in a flour bin of a mill.

CHARLES E. MUNROE

A dust explosion caused by broken extension light. DAVID J. PRICE. *Millers' Rev.* 39, 270(1920).—A serious explosion occurred May 20, 1920, at a large modern elevator in Buffalo where an extension electric lamp had been lowered into an elevator leg and so covered by wheat that when later an official opened the gate in the leg he failed to observe the lamp. This lamp probably flowed through with the grain into the pit and either the bulb or the wires became broken causing an arc which ignited the explosive air-dust mixt.

CHARLES E. MUNROE

Experimental trinitrotoluene poisoning (HAYTHORN) 11H.

Explosives. O. SILBERRAD. Brit. 150,002, Aug. 11, 1920. See U. S. 1,340,983 (C. A. 14, 3323).

Stabilizing nitrocellulose. C. E. REGSE. U. S. 1,358,653, Nov. 9. Dicyanodi-amide 0.1-2.0% is used as a stabilizing agent for pyroxylin, with or without camphor and various other solvents.

Time-burning railway signal fuses. L. S. ROSS. U. S. 1,359,922, Nov. 23. Signal fuses are charged with a nitrate such as $\text{Sr}(\text{NO}_3)_2$ or $\text{Ba}(\text{NO}_3)_2$; the particles of which are slightly coated with petroleum grease or a similar waterproofing material, S and a small quantity of chlorate packed in a tube so that the compn. remains un-impaired when kept for a prolonged time.

25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

Dyestuff industry in relation to national economies. I. W. ALWYN-SCHMIDT. *Color Trade J.* 7, 167-70 (1920). E. J. C.

Nomenclature of naphthalene and anthracene intermediates with abbreviated chemical or trade names. W. N. WATSON AND A. R. WILLIS. *Color Trade J.* 7, 190-1 (1920).—Full chem. names are given for the abbreviated chem. or trade names. E. J. C.

Color characteristics of Congo rubin. R. HALLER. Grossenhain. *Kolloid-Z.* 27, 188-95 (1920).—From his own expts. and those of others H. concludes that Congo rubin solns. contain 2 different chem. or phys. modifications of the parent substance. One is red and very highly dispersed, while the other is blue and is composed of much larger particles. The red dyes cotton and wool by intussusception, the blue by apposition. These two processes may, of course, take place simultaneously. In fact cotton fabric may take on an intense blue color, while in the same soln. the unraveled threads may be dyed deep red. A blue-violet soln., if shaken with finely divided BaSO_4 , will yield a blue ppt. and a red supernatant liquid. H. believes that the combined phenomena of intussusception and apposition are common in substantive dyeing. E. B. SPEAR

Cymene as a by-product in the sulfite process (ASCHEN) 23. Waterproofing composition (U. S. pat. 1,359,826) 18.

Dyes; intermediate products. R. ARNOT. Brit. 149,354, July 22, 1920. Azo dyes are obtained by coupling diazotized aminoretene or its derivs. with azo dye components. According to examples—retene is nitrated by means of fuming HNO_3 , the nitroretene is dissolved in alc. NaOH and reduced with hydrosulfite, and the amino-retene is diazotized and coupled with R-salt, G-salt, "Andersen's salt," H-acid, or α -naphthol; retenequinone is nitrated with fuming HNO_3 , the nitroretenequinone is reduced as described above, the amino compd. is diazotized and coupled with R-salt, G-salt, "Andersen's salt," H-acid, β -naphthol, or α -naphthylamine; retene is sulfonated by fuming H_2SO_4 , the product nitrated by concd. HNO_3 , reduced by means of Fe powder, and diazotized and coupled with R-salt, G-salt, "Andersen's salt," or H-acid.

Dyes; intermediate products. Société ANON. POUR L'INDUSTRIE CHIMIQUE À Bâle. Brit. 149,553. 1,8-Dihydroxysulfonaphthalene carboxylic acids having a free 2- or 7- position, are prep'd. from disulfonaphthalene carboxylic acids having a sulfo group in 1-position by nitrating them in the free 8-position, reducing the nitro group to the amino group, replacing the sulfob group by hydroxyl by the diazo reaction, and finally

replacing the 1-sulfo group by hydroxyl by alkali fusion. Monoazo dyes are prep'd. by coupling aromatic diazo or *o*-hydroxydiazo compds. with these 1,8-dihydroxysulfo-naphthalene-carboxylic acids. The products are mordant dyes and may be dyed on wool with chrome mordants or printed on chrome-mordanted cotton. The mordant character of the dyes may be enhanced by using as the diazo component diazocarboxylic acid or *o*-hydroxydiazo compds. derived from salicylic acid. Examples are given.

Dyeing and printing; dyes. J. W. McMYN. Brit. 149,428, May 13, 1919. Mono-azo dyes containing the sulfonamide group $-\text{SO}_2\text{NH}_2$ or $-\text{SO}_2\text{NHR}$ (R = methyl, ethyl, phenyl, etc.), but no sulfonic or carboxylic group are prep'd. by coupling a diazotized aminophenylsulfonamide or aminotoluenesulfonamide with an amine or phenol. The products are insol. in H_2O or alkali carbonates, but sol. in caustic alkali, and are employed for dyeing or printing cotton by impregnating the material with a caustic alkali soln. of the dye (thickened if necessary) and then pptg. and fixing the dye on the material by means of CO_2 , bicarbonates, NH_4 salts, weak acids, or alum. Examples of padding and printing processes are specified.

Azo dyes. G. DE MONTMOLLIN. U. S. 1,359,909, Nov. 23. Acid wool dyes are obtained by combining diazotized derivs. of monodiacyl compds. of diaminodaryl-sulfones and 2-aminonaphthalene compds., which are red-brown to dark-brown to violet powders, sol. in H_2O with orange-red to brown and violet colorations, dyeing wool in an acid bath orange-red to blackish violet tints fast to washing and to light. Several examples of different dyes produced are given.

Sulfur dye. M. WYLER. U. S. 1,358,490, Nov. 9. A reddish brown dye suitable for use on cotton is formed by beating acenaphthene 1 with S 3.5 parts to a temp. of about 250-300° for about 24 hrs., dissolving the product in a boiling 10% soln. of Na_2S and pptg. the dye with HCl .

Dyeing composition. W. J. MILLER. U. S. 1,358,456, Nov. 9. A compn. suitable for dyeing paper, leather, straw, wood, bone or feathers, is formed of gum arabic 1, gallæ 2, FeSO_4 3, $\text{K}_3\text{FeC}_6\text{N}_3$ 0.03, pyroligneous acid 0.65, hematin 1, aniline nigrosine 0.006 and H_2O 64 parts.

Red color lakes. A. LINZ. U. S. 1,358,007, Nov. 9. A blue-red or scarlet lake is formed by treating the dye produced by the combination of diazotized *p*-nitro-*o*-toluidine and 2-naphthol-3,6-disulfonic acid with BaCl_2 or other metallic salts. The lake formed with BaCl_2 is insol. in H_2O , C_6H_6 , toluene and linseed oil.

Skein-dyeing apparatus. H. M. DUDLEY. U. S. 1,359,043, Nov. 16.

Waterproofing composition. F. MCPHILLIPS. U. S. 1,358,226, Nov. 9. A waterproofing compn. adapted for treating tenting or similar material is formed of "distillate" or similar mineral oil 59%, gilsonite 35% and fish oil 6%.

Fireproofing cotton or similar fabrics. C. L. SAUNDERS, G. C. STANLEY and C. W. BENNETT. U. S. 1,358,250, Nov. 9. Cotton fiber is rendered more easily impregnated with Na stannate by boiling in H_2O , treating the boiled fiber with a 2% aq. soln. of HF, washing and partially drying. The material is then rendered fire-resistant by impregnation with $(\text{NH}_4)_2\text{SO}_4$ which reacts with the Na stannate on the material.

Dyes. R. MACLAURIN. Brit. 148,617, Apr. 24, 1919. The pat. relates to the prep'n. of dyestuffs from the oil and ammoniacal liquors which result from the low-temp. gasification of bituminous fuels, as described, for instance, in 24,426, 1913 (C. A. 9, 1387). The NH_3 liquor or the liquor obtained by washing the oils with H_2O is first freed from NH_3 and H_2S , and after being made neutral, is treated with a ferrous salt such as FeSO_4 . A ppt. is obtained, which in an alk. bath gives slate-colored shades on wool, or by after-chroming yields brown shades. The filtrate is made acid, NaNO_2 added, and then more ferrous salt is added to the neutral soln., whereby all the quinone oxime present is thrown down as a ppt., which dyes greens, on iron-mordanted wool, similar to resorcinol green. The treatment of the liquors with nitrous acid may pre-

cede the addition of the ferrous salt. Salts of the alkali metals or of NH₄ may be added to aid the pptn.

Dyes; intermediate products. I. CASSELLA & Co., Ges. Brit. 148,339, July 9, 1920. A vat dye, giving claret-red shades, is obtained by condensing hydrazine or a salt thereof with 1-aminoanthraquinone-2-aldehyde or the azomethine compds. thereof. The parent azomethine compds. are obtained by heating 1-amino-2-methylanthraquinone with aromatic nitro compds. and alkalies, with or without the addition of primary aromatic amines; 1-aminoanthraquinone-2-aldehyde results on hydrolyzing these azomethine compds. by acids.

Printing fabrics. R. N. NELSON. Brit. 148,650, May 3, 1919. In the process for printing fabrics in two or more colors in which the sheet of fabric is secured by starch or other suitable adhesive to a supporting sheet of stiff paper, passed through a lithographic printing machine the requisite number of times, and then removed from the paper support, a paste dryer of terebene and gold size is mixed with the lithographic ink to cause the impressions to dry rapidly to prevent running of the colors. The invention is particularly designed for printing fabric labels for wearing apparel.

Skein-dyeing apparatus. A. T. SCARAMUZZI. U. S. 1,357,522, Nov. 2.

Washing and fixing fabrics. K. GRUNERT. Brit. 149,000, July 12, 1920. To fix and wash out fabrics that have been satd. with lye for the purpose of mercerizing, the stretched fabric enters into a cold rinsing bath in a tank divided into compartments and provided with a cooling device whereby some of the lye is removed, then the fabric is led around stretching rollers and between rollers into a steam chamber where it is stretched by a roller and fixed by the steam, after which it passes between pressing rollers direct into the cold bath, without coming into contact with external air, and is sprayed by H₂O splashed by a beater. Afterwards the fabric passes to and from the steam chamber over guide reels and finally leaves the app. A suitable app. is specified.

Fibers from viscose. A. R. FULLER. U. S. 1,357,206, Oct. 26. A soln. of viscose or similar material is centrifugally forced through a fiber-forming aperture and treated with a coagulating agent immediately on its exit from the aperture. An app. is described.

26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

White compounds of lead. ANON. *Chem. Trade J.* 67, 574-5 (1920).—A draft of proposed regulations. E. J. C.

Varnishes for protection and insulation. ANON. *Elec. Rev.* 77, 944 (1920).—A review describing briefly the different types of varnishes and oils used in elec. app. manuf. C. G. F.

Chemistry of resins. A. ZINKE. Univ. Graz. *Pharm. Monatshefte* 1, 105-14 (1920).—The subject is treated from both a historical and a critical standpoint. W. O. E.

Making wood fire-resistant with paint (ANON.) 20. Detergents (for paint) (BRIT. pat. 148,728) 27.

Paint. J. C. NOLAN. U. S. 1,358,870, Nov. 16. A paint is formed of coal tar 20 gals., cement 10 lbs., paraffin 5 lbs., Ph₃O₄ 5 lbs., S 2 lbs., NaCl 2 lbs. and pitch 20 lbs.

Mixed paints. F. F. BRADLEY. U. S. 1,360,085, Nov. 23. The pat. relates to

a method of packaging paint materials of different colors which when mixed in the quantities supplied will produce certain uniform tints.

"Antifouling paint." C. E. WICKLIFFE. U. S. 1,358,289, Nov. 9. An anti-fouling paint adapted for use on ships is formed of Hg cyanide, Paris green or other pigments, linseed oil, turpentine and japan.

Zinc sulfate; pigments. R. T. D. WILLIAMS, R. T. GEPP and K. P. WEBB. Brit. 149,297, July 16, 1920. $ZnSO_4$, such as that diverted from an electrolytic circuit which contains Mn, is purified for the production of lithopone in such a manner as to allow equiv. quantities of the sulfate and sulfide radicals to be present in the reaction for producing the lithopone. For instance, the Mn is removed by an alkali hypochlorite or a mixt. of an alkali sulfate and bleaching powder; or by leaching powder with a subsequent addition of an alkali sulfate to replace the amt. of sulfate radical removed as $CaSO_4$. If the base of the hypochlorite forms an insol. sulfide, an equiv. amt. of Na_2S is added. The lithopone obtained from the purified soln. is stated to be resistant to sunlight.

Pigments. TITAN CO. Brit. 149,316, Apr. 30, 1920. TiO_2 is obtained in a softer and whiter condition than heretofore by calcining a mixt. of Ti hydrate or oxide (alone or associated with $BaSO_4$ or $CaSO_4$) with a small proportion of a suitable P compd. such as H_3PO_4 or $CaSO_4$. The cryst. product is pulverized. In one process a soln. of the sulfates of Fe and Ti is boiled. A ppt. is formed to which, if H_3PO_4 is used, is added a salt of an alk. earth metal to form an insol. sulfate with the small fraction of sulfate in the ppt. In another process a mixt. of the sulfate is electrolyzed and then boiled as described in 108,850. To the ppt. are added $BaCO_3$, $CaCO_3$, and $CaSO_4$. The mixt. obtained in each case is then calcined. When the oxide is the Ti compd. used it is prep'd. by beating the hydrate to a temp. just sufficient to remove the H_2O . Cf. 104,885, 105,645 (C. A. 11, 2282), 105,648 (C. A. 11, 2282), 108,875 (C. A. 12, 231), 110,535, and 116,266 (C. A. 13, 64).

Calcimine. W. F. BURDEN. U. S. 1,359,228, Nov. 16. A calcimine is formed of china clay 400, whiting 1419, cold water glue 125, $Pb(OAc)_2$ 30, powdered alum 25 and Pb oleate 1 lb.

Coating for metals. C. FELL. U. S. 1,358,304, Nov. 9. A mixt. adapted for coating metals to protect them from rust is formed of boiled linseed oil 12-18, petroleum naphtha 8-12 and C_6H_6 , toluene or xylene 70-80%.

Coating for iron. P. E. KING. U. S. 1,360,226, Nov. 23. A compn. for coating Fe is formed of red lead 50 lbs., Fe oxide 50 lbs., litharge 20 oz., raw linseed oil 4 gals., turpentine 1 gal., kerosene 1 gal. and japan drier 2 qts.

Japanning. N. C. F. JENSEN. Brit. 149,371, Feb. 19, 1919. A process for preserving metals or metal articles from oxidation or rusting, of the kind in which the metal is furnished with a protective adherent film as the result of the application of oil and a high temp., consists in dipping them in a bath of mineral lubricating oil which may be mixed with a proportion of paraffin oil to render it more fluid and mobile, draining off excess oil, heating them in a chamber or oven at a temp. of about 300° until the moist condition is removed and the surface presents a grayish color or mat appearance, then dipping while hot in another bath of oil, such as a mixt. of equal parts of whale oil and mineral lubricating oil, and finally cleaning by means of sawdust, etc. The adherent film thus produced acts as an insulator when the articles so treated are employed in elec. contrivances.

Pyroxylin varnish. W. ALEXANDER and J. E. CLEGG. U. S. 1,358,914, Nov. 16. A satd. soln. of H_3BO_3 in methylacetone 605, is mixed with 245 parts of a pyroxylin varnish formed of methylacetone 105, amyl acetate 115 and celluloid 25 parts. This soln. produces a white frosted effect on glass or other surfaces. Pigments may be added.

Coating composition. C. L. WESTRICK. U. S. 1,360,066, Nov. 23. A coating

mixt. adapted for use on automobile bodies is formed of vinegar 2, beer 2, glycerol 1 part and a pigment, *e. g.* lampblack.

Polishing composition for varnished surfaces. M. B. SACKS. U. S. 1,359,536, Nov. 23. A mixt. adapted for use as a furniture polish is formed of boiled linseed oil 1 gal., turpentine 1 pint and vinegar 1 qt.

Floor coverings. PHENOLGUM GES. Brit. 149,861, July 2, 1920. Addition to 146,367 (*C. A.* 14, 3807). Phenol-HCHO is added to a mixt. of glue or carbohydrate and glycerol, KCNS or other hygroscopic substance, and the mixt. is kneaded and rolled with cork meal, sawdust or other fillers and with or without viscose, as described in the principal patent. The product may be used as a substitute for linoleum with or without a backing of paper or fabric.

Synthetic resins, etc. F. FISCHER. Brit. 149,979, Aug. 10, 1919. Resinous or asphalt-like bodies are obtained by treating phenols or mixts. containing phenol with O or gases containing O under pressure. The process is preferably carried out with the phenols in aq. soln. or in presence of aq. liquids; catalysts such as Fe or diluents such as hydrocarbons may be added. Phenolic tars or tar oils may be treated by the process. According to examples, carbolic acid or cresol dissolved in soda lye, or *o*-cresol mixed with dil. H_2SO_4 , are treated with air at 40 atm. pressure at 200°.

Synthetic resins. BARRATT CO. Brit. 149,982, Aug. 10, 1920. In the production of resins from solvent naphtha by polymerization of the coumarone, indene, etc., present by means of H_2SO_4 , the resulting naphtha soln. of resin, after neutralization of acid present by means of alkali, is washed with an acid weaker than H_2SO_4 , *e. g.* HCl, prior to distn. The neutralization by alkali may be omitted and the acid soln. washed direct with HCl.

27—FATS, FATTY OILS AND SOAPS

E. SCHERUBEL

Progress in theoretical chemistry of fats during 1919. W. FAHRION. *Chem. Umschau* 27, 214-6(1920).—A short review of new material in fat chemistry gathered during 1919 under the captions of physiology, glycerides, fatty acids, resin acids, ketones, hydrocarbons, rancidity, drying process, hydrogenation, fat cleavage, glycerol and soaps.

P. ESCHER

Central station for scientific oil and fat investigations. ANON. *Chem. Umschau* 27, 213, 225(1920). A new organization for the scientific investigation of oils and fat will take over the material left by the scientific division of the Nat. (German) committee for oils and fats which terminated Oct. 1st. The *Chem. Umschau* will be its official organ. The personnel of 7 sub-commissions is given.

P. ESCHER

The history of the candle. P. MARTELL. *Seifensieder-Ztg.* 47, 773, 788-9(1920).—A short review of the history of candles from ancient times through the early industrial manuf. by Braconnot & Simonin in 1818.

P. ESCHER

Recovery and utilization of wool fat. G. HARTMANN. Eisenach. *Seifensieder-Ztg.* 47, 732-3(1820).—The waste waters are centrifuged at 40° and 1800 r. p. m.; the centrifuges require cleaning every 6 hrs. The scum on the exit water from the centrifugals is centrifuged again. The crude fat is boiled with an equal vol. of H_2O and a little H_2SO_4 and then washed with boiling H_2O . It is boiled with fresh water, and enough KOH to form a creamy emulsion. This is allowed to sep. 1 hr., forming an oily layer of neutral wool fat on a dil. soap soln. The clear layer is drawn off and stored in settling tanks.

P. ESCHER

Chlorinated fatty acids and oils in the chemical industry. J. GÄRTH. *Z. deut. Öl. Fett. Ind.* 40, 613-6, 631-4(1920).—A compilation of the principal journal and patent literature, considered under the following headings: Chlorinated textile oils.

Chlorinated fatty acids in the candle industry. Bleaching of oils and soaps by hypochlorites. Under this heading 3 expts. are recorded: Grained soap in soln. was treated at 80° with 0.5% active Cl in the form of NaClO soln. containing 1.5-5.0% free NaOH. By previous expt. the latter did not lose active Cl at 80°. The result showed a decided bleaching effect, but also an added Cl odor, not present originally. A subsequent treatment of one of these bleached samples with NaHSO₃ soln. lessened the Cl odor. But Cl-bleached soaps usually show an after-darkening on storage, the reason for which is not clear. The author thinks that Cl bleaching does not produce satisfactory results. A bibliography of 39 titles, including patents, is added.

P. ESCHER

Polymerization of oils. H. WOLFF. Berlin. *Kolloid-Z.* 27, 183-8(1920).—The polymerization of oils by heating is usually accompanied by chem. changes. In some cases the new compds. formed have been isolated. The phenomenon has not been fundamentally studied except in the case of wood and linseed oils. The polymerization of the latter on heating out of contact with the air proceeds with appreciable rapidity only after the temp. has reached 160°. During the process the viscosity and sp. gr. of all oils increase, while the iodine number becomes less. The coeff. of refraction also increases with the exception of wood oil. The latter gelatinizes much more easily than the others when subjected to the treatment. E. B. SPEAR

Evaluation of Karbolineum and other impregnating oils. O. HILDEBRAND. *Seifensieder-Ztg.* 47, 740(1920).—A simple factory test has been introduced by Dr. H. Nördlinger: 50 g. of the oil are weighed into a dish contg. a glass rod. Enough filter-paper cuttings are added to absorb all of the oil and the whole is reweighed to obtain the wt. of added paper. In a dust-protected place this mixt. is stirred several times daily until no more loss in wt. occurs. A poor oil loses much weight, and may resinify; a good oil loses little wt. and retains its oily character. P. ESCHER

The crushing of palm kernels. J. H. SHRADER. *Cotton Oil Press* 4, No. 7, 51-2 (Nov. 1920).—A brief description of the palm kernel and the common practice of obtaining palm kernel oil, followed by details of the successful pressing of this oil seed in Anderson expellers. Attempts to handle palm kernels the same as copra, viz., the first pressing in expellers and the second in hydraulics, were unsuccessful. A regular full-size expeller was modified to give about triple the usual speed of the worm and with this machine 2,000 lbs. of kernels could be pressed per hr. The first cake which contained 25% oil was reground and run through a stock expeller at the rate of 500 lbs. per hr. yielding a cake with 6% oil. Full details of the power required and grinding equipment used are given. The method of detg. the % of oil in cake is discussed and data are given showing that in soxhlets even when the cake is reground with sand after 16 hr. extn. with Et₂O some oil remains after 20 hrs. extn. H. S. BAILEY

Oil of the prickly pear seed. S. LOMANITZ. *J. Ind. Eng. Chem.* 12, 1175(1920).—The following consts. were detd.: d₄₅ 0.9294, acid no. 8.09, sapon. no. 189.5, I no. 116.3, ester no. 187.47, R. M. no. 2.8, Hehner no. 93.8, n_D²⁰ 1.46764. E. SCHERUBEL

Direct identification of soy-bean oil. CHAS. S. NEWHALL. *J. Ind. Eng. Chem.* 12, 1174-5(1920).—A modification of L. Settin's test is used. Five cc. of CHCl₃ are added to 5 cc. of the oil mixed in a test tube with a few drops of gum arabic soln. and 5 cc. of a 2% soln. of uranium nitrate or acetate and shaken to form an emulsion. All samples of crude and refined soy-bean oil examd. gave a lemon-yellow emulsion.

E. SCHERUBEL

Eschwege soaps. A. Z. *Seifensieder-Ztg.* 47, 691-2, 712-3(1920).—Eschwege soaps are made by mixing a boiled and settled animal fat (tallow) soap with a boiled coconut or palm-kernel soap with addition of enough ultramarine to give a marbled effect. A description of its manuf. from the view-point of a practical soap boiler is given. P. ESCHER

Acid-stable laundry soaps. WELWART. Vienna. *Seifensieder-Ztg.* 47, 675-6 (1920).—W. records a case of 2 Italian laundry soaps which yielded a permanent emulsion on decomprn. with acid in place of the normal clear layer of fatty acids. He succeeded in obtaining a clear sepn. by adding a weighed quantity of stearic acid to 10 g. of the soap, decomposing with 50 cc. concd. HCl and boiling gently for 3 hrs. From the presence of considerable SO₃ and from the fact that the acids showed an acetyl value of 39.5, W. concludes that sulfonated castor oil formed part of the soap-kettle charge.

P. ESCHER

Centrifugal separation of soap stock. J. H. SHRADER. *Cotton Oil Press* 4, No. 6, 50-51 (1920).—In order to hasten the sepn. of the soap stock from the refined oil and decrease the refining loss, use is made of a basket-type centrifugal having a solid bowl with horizontal baffles. By feeding the soap stock oil mixt. in at the bottom of the bowl beneath the lowest baffle centrifugal force seps. the soap, packing it to the sides of the bowl and discharges nearly clean oil at the top. It is necessary to wash the oil with water after this process to remove the last traces of soap but this is already common practice with coconut and other oils refined by the older settling process. Results of refinings made "by centrifugation" and settling show that by the former method the loss is much less than by the latter. The color of the washed cottonseed oil is also considerably lighter than that of the same oil refined by the present settling process.

H. S. BAILEY

Viscosity of distilled glycerol. J. KELLNER. *Z. deut. Öl. Fett. Ind.* 40, 677-8 (1920).—The Engler viscometer was used to det. the viscosity of glycerol solns. containing 75-99% of glycerol, and a table is given showing d₁₅ and viscosity at 24°. Inasmuch as the difference in viscosity between 75 and 99% glycerol lies between 2.75 and 73.25 Engler it is possible to det. the % by this method with fair accuracy. It was also demonstrated that the viscosity is a measure of the org. impurities present, a glycerol made from rancid fats having a higher viscosity than one from non-rancid fats.

E. SCHERUBEL

Fatty acids, etc. (BRIT. pat. 149,974) 10.

Removing fat or oil from raw wool. F. KOCH. U. S. 1,358,163, Nov. 9. Fat or oil is removed from raw wool or similar material by the use of an aliphatic chlorinated hydrocarbon, e. g., C₂H₅Cl₂ or C₂HCl₃, without soap, soda or other emulsifying agent.

Splitting fats. W. J. MELLERSH-JACKSON. Brit. 149,748, May 15, 1919. Fats and oils, particularly those of low grade, are split into glycerol and fatty acids by the sulfonic acid or acids that are extd. by H₂O from mineral-oil acid sludge, as described, e. g., in 143,682 (C. A. 14, 2984). In an example, fat or oil is heated and agitated with 30-50% by vol. of H₂O, 1-2% of sulfonic acids, and 1% of H₂SO₄ at 60° Bé. Splitting commences when the mixt. boils.

Detergents. M. LONGBOTTOM. Brit. 149,728, May 23, 1919. A detergent, particularly useful for cleaning and preserving *paint work*, is obtained by boiling in a closed vessel for about 30 min. about 2 lb. soft soap, 1/2 pt. NH₃, 1/2 pt. methylated spirit, 2 lb. soda ash, 1 gallon urine, 1 gallon H₂O, and 1 oz. oil of citronella.

28—SUGAR, STARCH AND GUMS

P. W. ZERBAN

The sugar industry of France since the war. T. J. MURPHY. *Can. Chem. J.* 4, 339-40 (1920).

E. J. C.

The lubrication of sugar mill machinery. ANON. *Lubrication* 6, No. 9, 1-8 (1920).

E. J. C.

General.

Recent advances in defecation. W. D. HORNE. *J. Ind. Eng. Chem.* 12, 1179-80 (1920).—See *C. A.* 15, 186.

F. W. ZERBAN

The preservation of bagasse in sugar-cane mill control. GUILFORD L. SPENCER. *J. Ind. Eng. Chem.* 12, 1197 (1920).—HCHO is not a safe preservative for the purpose, but NH₃ gives satisfactory results. The container for the bagasse sample is provided with perforated tin boxes at top and bottom, and these are filled with cotton satd. with NH₃. In analyzing the bagasse the use of Na₂CO₃ is omitted, and the water ext. is acidulated with AcOH before adding Pb subacetate. NH₃ plus CHCl₃ appears to give even better results than NH₃ alone.

F. W. ZERBAN

Determination of copper, particularly with respect to sugar determinations (BRUHNS) 7.

Starch; glucose. A. W. H. LENDERS. Brit. 149,374, Mar. 5, 1919. Starch which has been sepd. from amyaceous materials, such as maize, by the ordinary methods is treated with proteolytic bacteria to remove the residual protein matter. A suitable organism belonging to the type *Bacillus putrificus*, and obtained from decaying meat, is described. The starch mixed with H₂O is inoculated with the bacteria, and kept at 100-5° F. for some hrs. The supernatant liquor is removed, the starch again mixed with fresh H₂O, allowed to stand and settle. These operations are repeated for some days. Glucose is formed from the purified starch by hydrolyzing under pressure with HCl or other acid. The soln. is neutralized, mixed with kieselguhr, filtered, and concd. to form a syrup or sufficiently to crystallize on cooling. The hot concd. liquor may be beaten to the consistency of whipped cream, and seed crystals added. On cooling, a porous cryst. mass, which may be ground to a dry white powder, is obtained.

Apparatus for heating and clarifying sugar solutions. E. G. AIZCORBE. U. S. 1,358,132, Nov. 9.

29—LEATHER AND GLUE

ALLEN ROGERS

Tanning chemistry and technic in 1919. R. LAUFFMANN. *Ledertechn. Rundschau* 12, 65, 73, 84, 92, 102, 111, 118 (1920); *J. Am. Leather Chem. Assoc.* 15, 680-90 (1920).

E. J. C.

The quebracho tannins. W. MOGLER. *Collegium* 1920, 106-9.—According to M.'s theory (*C. A.* 10, 2998) a vegetable tannin is not a single substance but consists of at least two individuals; one of phenolic character, the other a quinone. The reactions of a tannin are detd. by which is in excess. In quebracho the quinone predominates. Quebracho tannin is obtained from the heart wood. An analysis of splint wood gave: tannins 6.4%, non-tannins 2.2%, insol. 76.4%, water 15.0%. In the heart-wood tannin is about 20% and the ratio of tannin to non-tannin 10:1. It differs also in character since it shows the reaction of the pyrogallol class. Veins of lighter color, 4 or 5 cm. across, occur in the heartwood and in this case the character of the quebracho tannin is different. M. thinks that the condensation and oxidation processes in the heartwood change the tannins from the pyrogallol to the pyrocatechic class. An analysis of such a stem gave: tannin 7.8%, non-tannin 1.7%, water 13.4%, ethyl acetate number 54.24, iron alum gave a dirty blue color, HCHO and HCl a brown ppt., AcOH and Pb(OAc)₂ a distinct ppt.

I. D. GARARD

A simplified method for the determination of the molybdenum number. R. LAUFFMANN. *Collegium* 1920, 129-30; cf. *C. A.* 7, 2703.—A brief repetition of the method is given and it is pointed out that while it is somewhat cumbersome for practical use, it is of great service in the examn. of exts. To simplify the method reckon the

"molybdenum ppt." on the totally sol. matter as follows: dissolve 0.7 g. in 250 cc. and filter. Ppt. 10 cc. with 10 cc. of the Mo reagent and filter again. Evap. 10 cc. with the second filtrate to dryness, then evap. 10 cc. of the first filtrate and 10 cc. of the mixt. of ammonium molybdate and NH_4Cl . Dry each to const. wt. Double the wt. found in the first evapn. and subtract it from the second. Some values obtained by this method are: oak-hark ext. 65.5-81.3, oak wood 112.0-152.1, pine bark 23.8-36.7, chestnut 148.2-194.3, quebracho not sulfited 2.0-33.8, quebracho sulfited 0.0-23.4, mangrove 117.9, mimosa bark 67.9. The reagent may also be used for qual. tests. I. D. G.

The proteolytic factor in the analysis of tanning materials. W. MOELLER. *Collegium* 1920, 307-19, 604, 374-81.—Expts. showed that during the analysis of tanning materials with hide powder, whether by the filtration method or by the shake method, considerable quantities of hydrolyzed hide substance mix with the soln. of the non-tans, thereby presenting wrong pictures of the compn. of the tanning materials. These are substances which are not themselves constituents of tanning materials, and must, therefore, be taken into consideration in the analysis, or be completely eliminated. The latter is, of course, the ideal condition, but necessitates the finding of some adsorbent which would not only resist the hydrolytic products of tanning materials, but would in itself be proof against hydrolysis. For reasons of expediency and with regard to the similarity of materials employed in practical tanning it may be desirable to use hide powder. In this case, however, some method of preliminary treatment of the powder must be found, differing from the chroming method, which would completely eliminate hydrolytic interference. The author's attempts in that direction so far have been fruitless. The use of formaldehyde suggested by Parker is of no avail, since the hydrolytic influence of formaldehyde is fully as great as that of other tanning soins. Claim is made by some investigators that it is useless to eliminate the hydrolytic factor during tanning analysis because it also prevails in practical tanning. The author rejects this on the ground of the difference in the action of tanning materials on hide powder and on raw hide. Not only is this due to the fact that in actual tanning there is an excess of tanning soln. while in analysis there is an excess of hide powder, but also because the reactions of raw hide differ from those of hide powder. The quantity of hide substance found in the non-tan solns. lies between the values obtained from the control expts. with chromed and non-chromed hide powder. A report will follow dealing with the nature and quantity of the constituents of the tanning materials properly belonging to the non-tans. B. S. LEVINE

Hide substance. G. L. TERRASSE. *J. Am. Leather Chem. Assoc.* 15, 608-20 (1920).—A survey of constituents of hide substance and their degradation products. Twelve amino acids which are cleavage products of the keratins are mentioned. Nine are monocarboxylic acids, the 3 remaining have two COOH groups each. No keratin cleavage mol. having more than 2 COOH groups has as yet been identified. Nine of the amino acids have one NH₂ group always in the α position. Cystine is the only diamino acid among the 12. Proline has no NH₂ group but an NH group in the α position. Nine also have aliphatic nuclei. Keratins on cleavage incline to the formation of monocarboxy acids. Eleven of the 12 contain at least one asymmetric carbon atom and are optically active. The levo form predominates. Each of the 11 has 3 isomers. Much of the keratinous material of hide is lost in beam-house operations, up to the present unavoidably. No keratin, collagen or gelatin has ever been synthesized. These amino acids have both acid and basic characteristics in the same mol. and it is possible for the acid part of one to join with the basic part of another, liberating H₂O. Pentose, hexose and glycogen are probably present in hide substance. Every skin contains fats often in large deposits immediately below the cutis vera. This survey is incomplete. The object is to show that a skin is an "enormously complicated complex." Degradation products of a skin include almost every known cleavage

product of life. T. believes that more specific knowledge of tanning will come from coördination of principles of biology and chemistry. C. F. JAMESON

Electrochemistry of tanning materials. III. Electroosmosis of mixtures, adsorption compounds, and split products of tanning materials. GEORG GRASSER. *Collegium* 1920, 322-41; cf. *C. A.* 15, 189.—*Quebracho-tannin-iron compounds.* Quebracho ext., filtered to clarity, was treated with an excess of iron alum soln., and brought to boiling. The ptd. Fe compd. was washed and redissolved in a hot dil. AcOH. Electroosmosis proceeded in a manner similar to that of the Pb compd., but the treated residue failed to reveal the presence of tanning substances. Some tannins sol. in NaOH were found inside the diaphragm. Analysis showed them to be decompn. products. Electroosmosis, therefore, offers no practical means for the sepn. of tannins from their Fe compds. *Quebracho-tannin-calcium compounds.* To a clear quebracho ext. soln. a soln. of CaCl_2 and $\text{Ca}(\text{OH})_2$ was added. A reddish brown substance easily sol. in H_2O was formed and ptd. with $\text{NH}_4\text{C}_2\text{O}_4$. Electroosmosis brought out a slow anodic migration of the tannins, giving reactions indicating their state of modification. The treated residue consisted of a clear brown fluid and of a dark brown ppt. The first, according to its reactions, contained quebracho tannins, and the latter, the water-insol. Ca salts of these tannins. *Quebracho-tannin-strychnine compounds.* Filtered alc. solns. of quebracho ext. and of strychnine were mixed, left standing for 48 hrs. and the brownish gray ppt. was dissolved in dil. AcOH. In the process of electroosmosis no substances migrated anodically. The strychnine migrated cathodically quant., none of it having been found in the treated residue. The tanning material proper remained, in a modified condition, in the treated residue. Hence, electroosmosis can not be employed either for the isolation or the detn. of quebracho tanning materials in their combination with strychnine. *Quebracho-tannin-methylene-blue compounds.* A soln. of quebracho ext. was treated with methylene blue in soln. The ppt. washed and dissolved in dil. AcOH. The methylene blue migrated cathodically, whereas the tannins remained in the treated residue partly in the original and partly in the modified condition. *Quebracho-tannin-gelatin compounds.* The compd. was prep'd. by mixing warm solns. of quebracho ext. with gelatin and heating the mixt. The ppt. formed emulsified in dil. AcOH. Electroosmosis showed that the gelatin migrated cathodically. The quebracho tannins were found in the treated residue in a slightly modified condition. In previous expts., both gelatin and the tannins migrated anodically and cathodically. Hence, electroosmosis is not to be regarded an appropriate process for the isolation of quebracho tannins from their gelatin compds. in either acid or alk. soln. *Hydrolysis of quebracho tanning materials.* Hydrolysis was brought about by prolonged boiling of the ext. in the presence of strong NaOH, and pptg. the split product by bringing the soln. to slight acidity with AcOH. In the process of electroosmosis the Na migrated to the catbode, where pure NaOH was found. The anodic dialyzate had an acid reaction, but failed to give reactions indicating the presence of tannin split products. Nothing definite could be concluded from the reactions of the treated residue. Hydrolysis products were also obtained through the action of H_2SO_4 . The dialyzates of the products thus obtained likewise failed to give definite conclusions. *Oxidation of quebracho tanning materials.* Oxidation was brought about by HNO_3 . The cathodic dialyzate was neutral and had no characteristic reactions. The anodic dialyzate was reddish brown and showed some qual. reactions of the original substance. The treated residue was clear and still possessed its original reactions. Oxidation with bromine water was also brought about. The anodic dialyzate, a clear colorless soln., possessed none of the tannin reactions, nor did it reduce KMnO_4 . The cathodic dialyzate, a slight brown fluid with a ppt., had no effect on gelatin, colored the ferric ion dark, and gave fuchsin-red streaks with concd. H_2SO_4 . Electroosmosis, as it seems, decomposes tannins beyond the stages of oxidation decompn. B. S. L.

Determination and behavior of free sulfuric acid in leather and in animal hide.
C. IMMERHISER. *Collegium* 1920, 360-7; cf. *C. A.* 13, 3035.—Hide and leather have a great affinity for free H_2SO_4 . It is less in leather than in hide and varies with the acidity of tanning materials used in the making of the leather. The H_2SO_4 content of leather made with neutral formaldehyde (19.7%) approaches the acid content of hide (21.0%). In the case of the strongly acid neradol D it is around 0.97%, and in the case of vegetable tanning it lies between 4 and 8%. The affinity for free H_2SO_4 diminishes with characteristic regularity as the tanning process proceeds. This can be utilized in following the tanning process proper, and in detg. the direction taken by it. Free H_2SO_4 is not present in leather made by the ordinary process nor in leather which had been previously plumped in the commonly used plumping baths. In testing leather for deleterious ingredients, it is well to det. the N content of the H_2O ext. which enables an indication of the decompn. effect of acid. In doing so, the N content of N-containing tanning materials, such as ordoval, should be disregarded, since it can not be accounted for mathematically.

B. S. L.

Sources of error in the Kjeldahl method of nitrogen determination and a modified procedure for the distillation of ammonia. **JULIUS KARL.** *Collegium* 1920, 367-74.—Expts. on the detn. of N in leather by the K. method have shown that it has sources of error which must be taken into consideration. The most important are: Lack of uniformity of the powdered leather; insufficient decompn. of the N-containing materials; the possibility of the alkali, or of the acid, or of particles of the zinc being carried over in the process of distg.; and of some NH_3 escaping with the air bubbles. These are eliminated by making the leather prepn. as homogeneous in size as possible, and by carrying out the distn. according to the following procedure: The sample, ready for distn., is kept in its undil. condition in a tightly stoppered Erlenmeyer flask connected with a tube funnel and a soda-lime tube and with a chain of two wash bottles, the first containing normal acid and the second an equal amt. of H_2O . The wash bottles are connected to a suction pump, the suction is started and the proper amt. of alkali allowed to run into the Erlenmeyer flask from the funnel tube. The Erlenmeyer flask is now placed in a water bath at about 50° and the water gradually brought to boiling. The current of air which first passes through the soda-lime tube, then through the funnel tube into the flask is so regulated as to admit from 140 to 180 bubbles per minute. In 1.5 to 2 hrs. the NH_3 will be completely carried over into the wash bottles. Care must be taken in setting up the app. to prevent air leakage through any of the connections. Photographs illustrating several individual pieces and the complete set up are given.

B. S. L.

Limeyard control. II. Analysis of lime liquors. **W. R. ATKIN AND W. E. PALMER.** *J. Am. Leather Chem. Assoc.* 15, 620-9 (1920); *J. Soc. Leather Trades Chem.* 4, 111 (1920); cf. *C. A.* 14, 2729.—Committee Report. It is suggested that for works control the following detns. will give necessary information quickly and accurately: (1) Total N, (2) NH_3 and amines, (3) sulfides, (4) total alkalinity, (5) caustic alkalinity, (6) amino acids, (7) acid splitting up products of proteins combined with Na and Ca hydroxides (subsequently called Na and Ca salts of hydrolytic products). Methods for all detns. are given, with formulas for the computations. Results of detns. performed on 6 widely different lime liquors are given. Earlier criticism of Bennett's method for the detn. of caustic alkalinity is continued.

C. F. JAMESON

The capacity of the animal skin to react with phenolaldehydes. **O. GERNGROSS.** *Biochem. Z.* 108, 82-97 (1920).—Studies were made of the reactions of 2-hydroxy-3-methoxybenzylideneglycylglycine ethyl ester; 2,3-dihydroxybenzylideneglycylglycine ester and 2,3-dihydroxybenzylidene-1-tyrosine methyl ester on the skin as used in tanning from the point of view of color, tanning effect and adsorption.

F. S. HAMMETT

Waterproofing composition (U. S. pat. 1,359,826) 18.

Leather. J. J. SROGCKIY. Brit. 149,334, July 19, 1920. Ultraviolet light obtained by means of a high-frequency spark is used instead of the Hg-vapor lamp for hardening the surface of patent leather. The usual Cu or brass electrodes may be used, or Al electrodes are stated to be suitable if the energy and frequency of the discharges do not exceed one kw. or 60 per second resp. The energy and frequency of the discharges are regulated according to requirements.

Synthetic tanning agents. M. MELAMID. Brit. 148,268 Feh. 23, 1920. Addition to 137,323 (C. A. 14, 1462). Synthetic tanning agents are prep'd. by sulfonating the alkali-sol. fractions of anthracene oil or soft pitch, and condensing the sulfonic acids with aromatic sulfonyl chlorides in alk. soln. According to example, the parent substance is sulfonated with H_2SO_4 monohydrate, the product dissolved in H_2O and neutralized with $NaOH$, Na_2SO_4 is removed by evapn., and the concd. soln. is mixed with $NaOH$ and treated with toluenesulfonyl chloride in benzene soln.

Synthetic tanning agents. M. MELAMID. Brit. 148,738, Feh. 25, 2910. Addition to 137,323 (C. A. 14, 1462). The alkali-sol. fractions of anthracene oil or soft pitch are sulfonated by means of H_2SO_4 monohydrate; the products constitute tanning agents.

Rawhide. J. T. MAHON. U. S. 1,359,087, Nov. 16. Rawhide is expanded and purified by treating it with about 6 times its wt. of H_2O , 50% its wt. of salt and about 1% its wt. of $NaHCO_3$.

30—RUBBER AND ALLIED SUBSTANCES

JOHN B. TUTTLE

Correlation between yield and number of rows of latex vessels in *Hevea brasiliensis*. W. BOBUOFF. *Arch. Rubbercultuur* 4, 383-91 (1920).—Frequency tables for the number of rows of latex vessels in the bark of trees forming 4 groups of 18821, 12362, 19082 and 491 trees are given. The curves show positive skewness and have a similar course to that found by Whitby for the rubber yield (C. A. 14, 1463). There was a marked positive correlation between the number of rows of latex vessels and the rubber yield. In the last group the correlation coeff. was detd. and found to be +0.55. G. S. W.

Latex and rubber from individual trees. II. O. DE VRIES. *Arch. Rubbercultuur* 4, 361-82 (1920); cf. C. A. 14, 3169.—(a) Although the latex and rubber from groups of trees are found, after a period of rest, to display the changes previously described (C. A. 12, 779), individual trees do not always, it is now observed, display the changes in question. (b) The influence of a change of tapping surface on several trees was examd., but no clear relation could be traced in individual trees between the length and position of the tapping cut on the one hand and the compn. of the latex and the vulcanizing properties of the rubber on the other (cf. C. A. 13, 1652). (c) Marked changes were observed in the latex and rubber from a given tree which was examd. on 98 occasions during a period of 9 months. G. S. WHITBY

Theory of the acceleration of vulcanization. A. DUBOSC. *Caoutchouc & gutta-percha* 17, 10511-4 (1920).—D. presents a hypothesis that the acceleration of vulcanization is due to the decompn. products and not to the accelerators themselves. He gives decompn. equations for aniline, aldehyde-ammonia, *p*-phenylenediamine, toluidine, urea, and hexamethylenetetramine, showing that the products of decompn. are $HCNS$, CS_2 , H_2S , and H_2O . The S in $HCNS$ is hexavalent, and readily gives up its S to the rubber immediately combining with bivalent free S to form a new molecule of $HCNS$. This reaction continues as long as any free bivalent S remains. This hexavalent S is capable of satg. 3 double bonds whereas bivalent S will sat. only one bond. Thus the time for reaching a definite coeff. of vulcanization can be reduced in the ratio

of 3 to 1. D. advances the theory that this action of HCNS corresponds to that of Spence's "active principle." Nitroso accelerators decompose to form HCNO, the latter combining with S to form HCNS. If this hypothesis is correct, the reaction of nitroso is identical with that of amine accelerators.

J. B. T.

The action of certain organic accelerators in the vulcanization of rubber. II. G. D. KRATZ, A. H. FLOWER and B. J. SHAPIRO. *J. Ind. Eng. Chem.* 13, 67-70 (1921); cf. *C. A.* 14, 1907.—Kratz and his co-workers have endeavored to explain the contradiction between one of the early patents in this field, which claimed that vulcanization by nitrogenous org. substances was confined to those having dissociation coeffs. of 10^{-8} or more, and Peachy's statement that substances which are not basic, or only slightly so, were efficient accelerators. Aniline and closely related substances were tried, as well as the HCl salts of two accelerators, methylaniline and *p*-toluidine. The results of these expts. lead to the use of ammonium sulfides. It was found that the dissociation const. is not a reliable guide to the activity of the substances as accelerators, and that the HCl salts were as active as the parent basic substances providing there was sufficient other basic substance, such as ZnO, to completely neutralize the acid liberated. Hydrazobenzene, having no basic properties, was found to strongly accelerate vulcanization. Heating rubber in a sealed tube at 147° for 6 hours with aqueous solns. of $(\text{NH}_4)_2\text{S}_2$ and NH_4SH resulted in a partial vulcanization, from which it is concluded that during the heating, S in an active form is liberated, in which condition it is able to combine with the rubber.

J. B. T.

Application of some amides and amines of furfural to vulcanization. A. DUBOSC. *Caoutchouc & gutta-percha* 17, 10495-505 (1920).—D. finds that furfuralamide is an excellent accelerator of vulcanization, as is furfurine, prep'd. by the isomeric transformation of furfuralamide when heated with dil. caustic. D. believes that during vulcanization, furfuralamide breaks down by the action of the S forming two mols. of HCNS, the latter acting as the carrier of S to the rubber. One of the secondary products formed is thiocarbonyl furfural which probably combines directly with the rubber. Furfurine contains 3 furfural nuclei; the first forms thiocarbonyl furfural as above; the other two combine to form thiocarbonyl furan. This substance can also act as a S carrier. A compd. consisting of 45% smoked sheets, 50% ZnO; 4% S and 1% furfuralamide, vulcanized at 135° in 20 min., of which 10 were consumed in reaching the temp. of vulcanization. The coeff. of vulcanization obtained was 2.574; the tensile strength was 3642 lbs. per sq. in.; the ultimate elongation 607%. A sample without the accelerator required 10 minutes to reach the vulcanization temp., and 60 minutes at 135°; the tensile strength was 1.580 lbs. per sq. in.; and the ultimate elongation 710%. Almost as good results as those with 1% were obtained with the use of only 0.75% and 0.50%. Any desired coeff. of vulcanization can be obtained by adding exactly the calcd. amt. of S with a mixt. of rubber, inert filler and 1% of furfuralamide. A coeff. of 2.7 is obtained from a mixt. of 50% rubber; 48% inert filler; 1.5% S and 0.5% furfuralamide; this is heated under a pressure of 3 atm. at 135° for 25 min. when all of the S will be combined, after which there can be no further vulcanization. With fillers which react with S, such as MgO, CaO, PbO, etc., a further quantity of S must be added to counterbalance this reaction.

J. B. T.

Effect of acids in retarding the rate of cure. H. P. STEVENS. *Bull. Rubber Growers' Assocn.* 2, 433-5 (1920); cf. *C. A.* 14, 3169.—Soaking crepe rubber in HCl (0.5-4%) reduces the rate of cure greatly; although not so greatly as soaking in H_2SO_4 was previously found to do. Soaking crepe rubber in AcOH of similar concns. has little effect on the rate of cure. The amt. of acid retained by the rubber is similar in the cases of HCl and AcOH and is approx. one-tenth of the amt. retained after soaking in H_2SO_4 . The HCl-soaked rubber, if later soaked for 4 months in water, almost recovers the normal rate of cure.

G. S. WURTBV

The expansion of rubber mixtures during vulcanization. A. DUBOSC. *Caoutchouc & gutta-percha* 17, 10508-11 (1920).—Using the app. designed by Sanderson (*C. A.* 14, 866), D. has made some measurements of the coeff. of expansion of various rubber compds. In general, his results show that the higher the percentage of rubber, the higher the coeff. of expansion, but beyond this no definite relations could be found, largely on account of other factors which are present. The expansion takes place in the first 15 minutes after which the curve becomes practically a straight line. In 2 samples of the same formula, one having fine hard Para had a coeff. of 2.337×10^{-4} while the other, with brown crepe, had 4.49×10^{-4} , excessive milling increased the coeff. of the fine Para until it reached that of the brown crepe. D. calls attention to the fact that air is occluded in all rubber mixts. and presents a factor which must be taken into account. At the temp. of vulcanization, D. believes that the O of the air combines with S to form SO₂ while the rubber resins and S form H₂S, the two gases liberating active S which combines with the rubber (cf. *C. A.* 14, 2873). J. B. T.

A new method for determining the elasticity of weak rubbers. ALFRED SCHÖN. *Mitt. kgl. Materialprüfungsamt* 37, 227 (1919).—An app. is described by means of which the elasticity of a rubber disk can be detd. by measuring the rebound of a pendulum bob from the disk. The thickness of the sample to be tested and the temp. at which the expt. is conducted are factors which must be carefully regulated. A. L.

Rossem, A. van: *Untersuchungen des niederländischen Staatl. Kautschuk-prüfungsamtes.* Teil V-VII. Dresden and Leipzig: Theodor Steinkopff. For review see *Kunststoffe* 10, 197 (1920).

Rubber fabric for shoe soles. J. M. OGILVIE. U. S. 1,356,783, Oct. 26. A 3-ply rubber fabric is formed for the manuf. of shoe soles and heels. The middle ply is highly fiberized and the upper ply unfiberized. The lower ply may be formed of elastic vulcanizable rubber compn.

Rubber-coated fabric. A. E. JURV. U. S. 1,358,920, Oct. 26. A fabric or yarn is first treated with a lubricant containing castor oil and beeswax and then with rubber.

Utilizing bark shavings from rubber trees. A. H. CLAESSEN. U. S. 1,357,845, Nov. 2. A material suitable for making roofing or floor coverings is formed by grinding and macerating bark shavings of rubber trees between heated rollers so as to knead the rubber with the bark material and convert the mixt. into a dough-like plastic material.

Vulcanizing rubber. S. J. PRACHEY. Brit. 146,734, Aug. 2, 1919. Rubber in soln. is vulcanized by the addition of S and small quantities of nitrosobenzene or a similarly constituted nitrosohydrocarbon of the cyclic series. In an example, 10 g. of rubber and 1 g. of S are dissolved in 150 g. of CS₂. 0.6 g. of nitrosobenzene is added and the soln. shaken. In about 30 min., the soln. sets to a jelly, which on evapn. of the solvent yields vulcanized rubber, insol. in the solvents for raw rubber.

Vulcanizing rubber. E. TILCHE. Brit. 148,350, July 9, 1920. Rubber is vulcanized by heating in an atm. of volatile alkali, such as NH₃ or org. alkali, and air, which may also contain inert or reducing gases. About 250 g. of NH₃ are used for every cu. m. capacity of the vulcanizing chamber. Thick articles may necessitate the employment of pressure, obtained preferably by the use of previously compressed inert or reducing gases.

Vulcanizing rubber. E. TILCHE. Brit. 148,349, July 9, 1920. Rubber is vulcanized in an atm. of volatile org. alkali, and it may be dild. with an inert or reducing gas or a mixt. of these, such as H₂S and CO₂. The addition of litharge is thus rendered unnecessary, and the color of mixings preserved. The temp. of vulcanization may be about 145°.

